

# DRAFT Resource Management Plan and Environmental Impact Statement for the Lander Field Office Planning Area



Wyoming Wind River Bighorn Basin District – Lander Field Office

## Volume 3 of 3 Glossary, Appendices and Maps

September 2011



The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

**Draft Resource Management Plan and  
Environmental Impact Statement  
for the  
Lander Field Office Planning Area**

**Volume 3 of 3  
Glossary, Appendices, and Maps**

**U.S. Department of the Interior  
Bureau of Land Management  
Lander Field Office, Wyoming**

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# Table of Contents

## VOLUME 3 OF 3

<b>Glossary .....</b>	<b>1317</b>
<b>Appendix A. Federal Laws, Regulations, Policies, Guidance, and Other Applicable Mandates and Authority .....</b>	<b>1343</b>
<b>Appendix B. Maps .....</b>	<b>1361</b>
<b>Appendix C. Recreation Management Area Forms .....</b>	<b>1367</b>
<b>Appendix D. Reclamation Objectives and Standards .....</b>	<b>1391</b>
<b>Appendix E. Exception, Modification, and Waiver Criteria .....</b>	<b>1395</b>
E.1. Introduction .....	1395
E.2. Exceptions, Modifications, and Waivers .....	1396
E.3. Standard Exception .....	1396
E.4. Resource Specific Exceptions .....	1397
E.4.1. Wildlife .....	1397
E.4.2. Cultural Resources .....	1398
E.4.3. Oil and Gas Actions .....	1398
E.5. Procedures for Exceptions .....	1399
<b>Appendix F. Lander Air Resources Management Plan .....</b>	<b>1401</b>
F.1. Purpose .....	1401
F.2. Air Quality Issues .....	1401
F.2.1. Magnitude of Emissions .....	1401
F.2.2. Pollutants of Concern .....	1402
F.2.3. Air Emission Generating Activities .....	1403
F.2.4. Geographic Areas of High Potential for Development .....	1403
F.2.5. Summary of Air Quality Issues .....	1404
F.3. Field Office Air Resource Management Requirements .....	1405
F.3.1. Authorization of Air Emission Generating Activities .....	1405
F.3.2. Monitoring .....	1406
F.3.3. Modeling .....	1407
F.3.4. Mitigation .....	1407
F.4. Project Specific Requirements .....	1407
F.4.1. Emissions Inventory .....	1408
F.4.2. Monitoring .....	1408
F.4.3. Modeling .....	1408
F.4.4. Mitigation .....	1409

<b>Appendix G. Example Detailed, Multi-phased, Reclamation Plan .....</b>	<b>1415</b>
<b>Appendix H. Best Management Practices .....</b>	<b>1431</b>
<b>Appendix I. Stipulations and Conditions of Approval in Designated Development Areas and in Non-Designated Development Areas .....</b>	<b>1435</b>
<b>Appendix J. Wyoming Standards for Healthy Rangelands.....</b>	<b>1437</b>
<b>Appendix K. Livestock Grazing Allotments and Range Improvements.....</b>	<b>1447</b>
<b>Appendix L. Economic Impact Analysis Methodology.....</b>	<b>1477</b>
L.1. Introduction.....	1477
L.2. The IMPLAN Model.....	1477
L.3. Oil and Gas .....	1478
L.4. Livestock Grazing.....	1483
L.5. Recreation .....	1486
<b>Appendix M. Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities.....</b>	<b>1489</b>
<b>Appendix N. Standard Oil and Gas Stipulations.....</b>	<b>1495</b>
<b>Appendix O. Fire Management .....</b>	<b>1499</b>
<b>Appendix P. Species Mentioned in the Lander Field Office Resource Management Plan and Environmental Impact Statement .....</b>	<b>1505</b>
<b>Appendix Q. Fire Regime and Vegetation Condition.....</b>	<b>1511</b>
<b>Appendix R. Lands Proposed by the Public for Land Tenure Adjustment(s).....</b>	<b>1517</b>
<b>Appendix S. Lands Identified for Disposal.....</b>	<b>1521</b>
<b>Appendix T. Surface Disturbance and Reasonable Foreseeable Actions.....</b>	<b>1535</b>
<b>Appendix U. Technical Support Document for Air Resources .....</b>	<b>1545</b>
U.1. Introduction.....	1545
U.1.1. Study Area .....	1545
U.1.2. Pollutants Addressed in the Analysis .....	1545
U.1.3. Thresholds of Significance.....	1546
U.1.4. Emissions Generating Activities Included in Analysis .....	1549
U.2. Methodology .....	1551
U.2.1. Emission Calculations by Category .....	1552
U.3. Mitigation and BMPs .....	1556
U.4. Summary of Emissions .....	1560

## List of Tables

Table A.1.	Federal Laws and Statutes .....	1343
Table A.2.	Bureau of Land Management Regulations and Policies.....	1348
Table A.3.	Applicable Wyoming State Laws and Regulations .....	1352
Table A.4.	Memoranda and Agreements.....	1353
Table C.1.	Lander Field Office Recreation and Visitor Services Objectives.....	1367
Table C.2.	Difference in Recreation Management Areas.....	1368
Table C.3.	Existing Recreation Management (Alternative A) .....	1368
Table C.4.	Special Recreation Management Areas .....	1369
Table C.5.	Distinct Extensive Recreation Management Areas .....	1370
Table C.6.	Alkali Basin Recreation Management Zone .....	1371
Table C.7.	Sweetwater Mining Recreation Management Zone .....	1372
Table C.8.	Designated Trails Recreation Management Zone.....	1374
Table C.9.	Dubois Mill Site Recreation Management Zone .....	1375
Table C.10.	Dubois Mill Site Recreation Management Zone .....	1377
Table C.11.	Johnny Behind the Rocks Recreation Management Zone.....	1378
Table C.12.	Sinks Canyon Recreation Management Zone.....	1380
Table C.13.	The Bus @ Baldwin Creek Recreation Management Zone .....	1381
Table C.14.	National Historic Trails Auto Tour Route Recreation Management Zone .....	1383
Table C.15.	Group Use Recreation Management Zone.....	1384
Table C.16.	Sweetwater Canyon Recreation Management Zone.....	1386
Table C.17.	Sweetwater Rocks Recreation Management Zone .....	1387
Table F.1.	Mitigation Table for Oil and Gas Development Activities.....	1410
Table I.1.	Application of Stipulations and/or Conditions of Approval (COAs) for Wellsite Activities on New Oil and Gas Leases in Designated Development Areas (DDAs) and in Non-DDAs .....	1435
Table K.1.	Grazing Allotments, Acres, Season of Use, and Animal Unit Months.....	1448
Table K.2.	Allotment Categorization – Current and Proposed.....	1460
Table K.3.	Lander Field Office Grazing Allotments Assessed for Meeting Standards.....	1467
Table K.4.	Allotment Management Plans and Rangeland Management Agreements Developed.....	1469
Table K.5.	Summary of Range Improvements Lander Field Office, 1986-2009 .....	1471
Table K.6.	Animal Unit Months Authorized, 1989-2008.....	1476
Table L.1.	Oil and Gas Well Numbers.....	1478
Table L.2.	Projected Oil and Gas Production (Federal Surface).....	1479
Table L.3.	Projected Oil and Gas Production (Federal State, and Fee Surface).....	1480
Table L.4.	Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type .....	1481
Table L.5.	Assumptions for Analysis of Economical Impacts on Output for Oil and Gas Production .....	1482
Table L.6.	Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type .....	1482
Table L.7.	Assumptions for Employment Impacts Analysis for Oil and Gas Production .....	1483
Table L.8.	Estimated AUMs by Alternative .....	1485
Table L.9.	Assumptions for Analysis of Impacts on Output for Livestock Grazing .....	1486
Table L.10.	Assumptions for Analysis of Employment Impacts for Livestock Grazing .....	1486

Table L.11.	Estimated Nonresident Recreation Visitor Days .....	1487
Table L.12.	Assumptions for Analysis of Impacts on Output for Recreation Activities.....	1488
Table L.13.	Assumptions for Employment Impacts Analysis for Recreation Activities .....	1488
Table O.1.	Fire Management by Fire Management Unit.....	1500
Table P.1.	Common and Scientific Names of Plant and Wildlife Species .....	1505
Table Q.1.	Fire Regime Groups and Descriptions .....	1511
Table Q.2.	Fire Regime Condition Classifications.....	1511
Table Q.3.	Forest and Woodland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area.....	1512
Table Q.4.	Grasslands and Shrubland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area .....	1514
Table S.1.	Lands Identified for Disposal .....	1521
Table S.2.	Resource Value Legend – Wildlife .....	1533
Table S.3.	Resource Value Legend – Cultural Resources.....	1533
Table S.4.	Resource Value Legend – Recreation .....	1533
Table S.5.	Resource Value Legend – Forestry .....	1534
Table S.6.	Resource Value Legend – Minerals .....	1534
Table T.1.	Summary of Projected Acres of Surface Disturbance by Resource.....	1536
Table T.2.	Oil and Gas Reasonable Foreseeable Development Assumptions.....	1543
Table U.1.	National and Wyoming Ambient Air Quality Standards.....	1546
Table U.2.	Prevention of Significant Deterioration Increments .....	1548
Table U.3.	Number of Existing and Proposed Wells by Alternative.....	1552
Table U.4.	Basis for Emissions Calculations for Land Resources Projects .....	1555
Table U.5.	Options for Air Quality Mitigation in the Planning Area.....	1556
Table U.6.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Base Year – 2008).....	1561
Table U.7.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2018).....	1563
Table U.8.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2027).....	1565
Table U.9.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2018).....	1567
Table U.10.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2027).....	1569
Table U.11.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2018).....	1571
Table U.12.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2027).....	1573
Table U.13.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2018).....	1575
Table U.14.	Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2027).....	1577
Table U.15.	Leasable Minerals – CBNG Development – Federal Wells (Base Year – 2008).....	1579
Table U.16.	Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2018) .....	1580
Table U.17.	Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2027) .....	1581

Table U.18.	Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2018).....	1582
Table U.19.	Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2027).....	1583
Table U.20.	Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2018).....	1584
Table U.21.	Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2027).....	1585
Table U.22.	Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2018) .....	1586
Table U.23.	Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2027) .....	1587
Table U.24.	Locatable Minerals – Bentonite Mining (Base Year – 2008).....	1588
Table U.25.	Locatable Minerals – Bentonite Mining (Alternative A – 2018) .....	1589
Table U.26.	Locatable Minerals – Bentonite Mining (Alternative A – 2027) .....	1590
Table U.27.	Locatable Minerals – Bentonite Mining (Alternative B – 2018).....	1591
Table U.28.	Locatable Minerals – Bentonite Mining (Alternative B – 2027).....	1592
Table U.29.	Locatable Minerals – Bentonite Mining (Alternative C – 2018).....	1593
Table U.30.	Locatable Minerals – Bentonite Mining (Alternative C – 2027).....	1594
Table U.31.	Locatable Minerals – Bentonite Mining (Alternative D – 2018) .....	1595
Table U.32.	Locatable Minerals – Bentonite Mining (Alternative D – 2027) .....	1596
Table U.33.	Locatable Minerals – Gold Mining (Base Year – 2008) .....	1597
Table U.34.	Locatable Minerals – Gold Mining (All Alternatives – 2018) .....	1598
Table U.35.	Locatable Minerals – Gold Mining (All Alternatives – 2027) .....	1599
Table U.36.	Locatable Minerals – Uranium Mining (Base Year – 2008).....	1600
Table U.37.	Locatable Minerals – Uranium Mining (All Alternatives – 2018).....	1601
Table U.38.	Locatable Minerals – Uranium Mining (All Alternatives – 2027).....	1602
Table U.39.	Salable Minerals – Sand & Gravel (Base Year – 2008) .....	1603
Table U.40.	Salable Minerals – Sand & Gravel (Alternative A – 2018).....	1604
Table U.41.	Salable Minerals – Sand & Gravel (Alternative A – 2027).....	1605
Table U.42.	Salable Minerals – Sand & Gravel (Alternative B – 2018).....	1606
Table U.43.	Salable Minerals – Sand & Gravel (Alternative B – 2027).....	1607
Table U.44.	Salable Minerals – Sand & Gravel (Alternative C – 2018).....	1608
Table U.45.	Salable Minerals – Sand & Gravel (Alternative C – 2027).....	1609
Table U.46.	Salable Minerals – Sand & Gravel (Alternative D – 2018).....	1610
Table U.47.	Salable Minerals – Sand & Gravel (Alternative D – 2027).....	1611
Table U.48.	Fire Management and Ecology (Base Year – 2008).....	1612
Table U.49.	Fire Management and Ecology (Alternative A – 2018) .....	1613
Table U.50.	Fire Management and Ecology (Alternative A – 2027) .....	1614
Table U.51.	Fire Management and Ecology (Alternative B – 2018).....	1615
Table U.52.	Fire Management and Ecology (Alternative B – 2027).....	1616
Table U.53.	Fire Management and Ecology (Alternative C – 2018).....	1617
Table U.54.	Fire Management and Ecology (Alternative C – 2027).....	1618
Table U.55.	Fire Management and Ecology (Alternative D – 2018) .....	1619
Table U.56.	Fire Management and Ecology (Alternative D – 2027) .....	1620
Table U.57.	Vegetation – Forest and Woodlands (Base Year – 2008).....	1621
Table U.58.	Vegetation – Forest and Woodlands (Alternative A – 2018) .....	1622
Table U.59.	Vegetation – Forest and Woodlands (Alternative A – 2027) .....	1623
Table U.60.	Vegetation – Forest and Woodlands (Alternative B – 2018) .....	1624
Table U.61.	Vegetation – Forest and Woodlands (Alternative B – 2027) .....	1625



Table U.62.	Vegetation – Forest and Woodlands (Alternative C – 2018) .....	1626
Table U.63.	Vegetation – Forest and Woodlands (Alternative C – 2027) .....	1627
Table U.64.	Vegetation – Forest and Woodlands (Alternative D – 2018) .....	1628
Table U.65.	Vegetation – Forest and Woodlands (Alternative D – 2027) .....	1629
Table U.66.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Base Year – 2008).....	1630
Table U.67.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2018) .....	1631
Table U.68.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2027) .....	1632
Table U.69.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2018).....	1633
Table U.70.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2027).....	1634
Table U.71.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2018).....	1635
Table U.72.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2027).....	1636
Table U.73.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2018) .....	1637
Table U.74.	Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2027) .....	1638
Table U.75.	Land Resources – Comprehensive Trails and Travel Management (Base Year – 2008).....	1639
Table U.76.	Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2018) ...	1640
Table U.77.	Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2027) ...	1641
Table U.78.	Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2018)....	1642
Table U.79.	Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2027)....	1643
Table U.80.	Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2018)....	1644
Table U.81.	Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2027)....	1645
Table U.82.	Land Resources – Comprehensive Trails and Travel Management Alternative D – 2018 .....	1646
Table U.83.	Land Resources – Comprehensive Trails and Travel Management (Alternative D – 2027) ...	1647
Table U.84.	Land Resources – Livestock Grazing (Base Year – 2008).....	1648
Table U.85.	Land Resources – Livestock Grazing (Alternative A – 2018) .....	1649
Table U.86.	Land Resources – Livestock Grazing (Alternative A – 2027) .....	1650
Table U.87.	Land Resources – Livestock Grazing (Alternative B – 2018).....	1651
Table U.88.	Land Resources – Livestock Grazing (Alternative B – 2027).....	1652
Table U.89.	Land Resources – Livestock Grazing (Alternative C – 2018).....	1653
Table U.90.	Land Resources – Livestock Grazing (Alternative C – 2027).....	1654
Table U.91.	Land Resources – Livestock Grazing (Alternative D – 2018) .....	1655
Table U.92.	Land Resources – Livestock Grazing (Alternative D – 2027) .....	1656
Table U.93.	Leasable Minerals – Conventional Oil and Gas Development – Total (BLM + non-BLM) Wells (Base Year – 2008).....	1657
Table U.94.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2018).....	1659
Table U.95.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2027).....	1661
Table U.96.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2018).....	1663
Table U.97.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2027).....	1665
Table U.98.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2018).....	1667
Table U.99.	Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2027).....	1669

Table U.100. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2018).....	1671
Table U.101. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2027).....	1673
Table U.102. Leasable Minerals – CBNG Development – Total (BLM + non-BLM) Wells (Base Year – 2008).....	1675
Table U.103. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2018) .....	1676
Table U.104. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2027) .....	1677
Table U.105. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2018) .....	1678
Table U.106. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2027) .....	1679
Table U.107. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2018) .....	1680
Table U.108. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2027) .....	1681
Table U.109. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2018) .....	1682
Table U.110. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2027) .....	1683

## List of Maps

Maps are included in electronic format. In hardcopy documents, maps can be found on a compact disk (CD) attached to the inside back cover of Volume 3.

Map 1.	Surface Ownership in the Planning Area .....	1361
Map 2.	Federal Mineral Estate in the Planning Area .....	1361
Map 3.	Dubois Area .....	1361
Map 4.	Physical Resources - Major River Basins .....	1361
Map 5.	Physical Resources - Riparian Areas.....	1361
Map 6.	Physical Resources - Class I Waters .....	1361
Map 7.	Physical Resources - Wind Erosion Potential.....	1361
Map 8.	Physical Resources - Water Erosion Potential .....	1361
Map 9.	Physical Resources - Annual Precipitation .....	1361
Map 10.	Physical Resources - Surface Slope .....	1361
Map 11.	Physical Resources - Soils with Low Reclamation Potential .....	1361
Map 12.	Physical Resources - Citizen Proposed Wilderness.....	1361
Map 13.	Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative B).....	1361
Map 14.	Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative D).....	1361
Map 15.	Mineral Resources - Uranium Mining Projects and Districts.....	1361
Map 16.	Mineral Resources - Geothermal Development Potential .....	1361
Map 17.	Mineral Resources - Conventional Oil and Gas Development Potential.....	1361
Map 18.	Mineral Resources - Salable Mineral Materials Sand and Gravel Occurrence Potential .....	1361
Map 19.	Mineral Resources - Phosphate Leasing Potential.....	1361
Map 20.	Mineral Resources - Coalbed Natural Gas Development Potential .....	1361
Map 21.	Mineral Resources - Locatable Mineral Withdrawals (Alternative A) .....	1361
Map 22.	Mineral Resources - Locatable Mineral Withdrawals (Alternative B) .....	1361
Map 23.	Mineral Resources - Locatable Mineral Withdrawals (Alternative C) .....	1361
Map 24.	Mineral Resources - Locatable Mineral Withdrawals (Alternative D).....	1361
Map 25.	Mineral Resources - Geothermal Energy Constraints (Alternative A) .....	1361
Map 26.	Mineral Resources - Geothermal Energy Constraints (Alternative B).....	1361
Map 27.	Mineral Resources - Geothermal Energy Constraints (Alternative C).....	1361
Map 28.	Mineral Resources - Geothermal Energy Constraints (Alternative D) .....	1361
Map 29.	Mineral Resources - Oil and Gas Constraints (Alternative A) .....	1361
Map 30.	Mineral Resources - Oil and Gas Constraints (Alternative B) .....	1362
Map 31.	Mineral Resources - Oil and Gas Constraints (Alternative C) .....	1362
Map 32.	Mineral Resources - Oil and Gas Constraints (Alternative D) .....	1362
Map 33.	Mineral Resources - Oil and Gas Fields and Leases.....	1362
Map 34.	Mineral Resources - Salable - Mineral Materials Disposals (Alternative A).....	1362
Map 35.	Mineral Resources - Salable - Mineral Materials Disposals (Alternative B).....	1362
Map 36.	Mineral Resources - Salable - Mineral Materials Disposals (Alternative C).....	1362
Map 37.	Mineral Resources - Salable - Mineral Materials Disposals (Alternative D).....	1362
Map 38.	Mineral Resources - Phosphate Leasing (Alternative A) .....	1362
Map 39.	Mineral Resources - Phosphate Leasing (Alternative B).....	1362

Map 40.	Mineral Resources - Phosphate Leasing (Alternative C).....	1362
Map 41.	Mineral Resources - Phosphate Leasing (Alternative D) .....	1362
Map 42.	Fire Management - Fire Regime Condition Classifications .....	1362
Map 43.	Fire Management - Fire Management Units .....	1362
Map 44.	Biological Resources - Precipitation Zones for U.S. Department of Agriculture National Resources Conservation Service Ecological Site Descriptions .....	1362
Map 45.	Biological Resources - Vegetation Communities and Major Land Resource Areas.....	1362
Map 46.	Biological Resources - Invasive Plant Species .....	1362
Map 47.	Biological Resources - Primary Forest Resource Management Areas .....	1362
Map 48.	Biological Resources - Proper Functional Condition Streams .....	1362
Map 49.	Biological Resources - Fish-bearing Streams .....	1362
Map 50.	Biological Resources - Bighorn Sheep Crucial Winter Range and Parturition Areas.....	1362
Map 51.	Biological Resources - Elk Winter Ranges and Parturition Areas .....	1362
Map 52.	Biological Resources - Moose Crucial Winter Range .....	1362
Map 53.	Biological Resources - Mule Deer Crucial Winter Range.....	1362
Map 54.	Biological Resources - Pronghorn Crucial Winter Range.....	1362
Map 55.	Biological Resources - Wyoming Game and Fish Department Bighorn Sheep Herd Units....	1362
Map 56.	Biological Resources - Wyoming Game and Fish Department Elk Herd Units.....	1362
Map 57.	Biological Resources - Wyoming Game and Fish Department Moose Herd Units .....	1362
Map 58.	Biological Resources - Wyoming Game and Fish Department Mule Deer Herd Units.....	1362
Map 59.	Biological Resources - Wyoming Game and Fish Department Pronghorn Herd Units .....	1362
Map 60.	Biological Resources - Big Game Migration Routes and Barriers.....	1362
Map 61.	Biological Resources - Wyoming Game and Fish Department White-tailed Deer Herd Units .....	1363
Map 62.	Biological Resources - Known Raptor Nests.....	1363
Map 63.	Biological Resources - Special Status Species Greater Sage-Grouse (Alternatives A and C) .	1363
Map 64.	Biological Resources - Special Status Species Greater Sage-Grouse (Alternative B) .....	1363
Map 65.	Biological Resources - Special Status Species Greater Sage-Grouse (Alternative D) .....	1363
Map 66.	Biological Resources - Special Status Species Lynx Analysis Units.....	1363
Map 67.	Biological Resources - Special Status Species Desert Yellowhead Critical Habitat .....	1363
Map 68.	Biological Resources - Wild Horse Herd Management Areas .....	1363
Map 69.	Heritage and Visual Resources - Cultural Resources .....	1363
Map 70.	Heritage and Visual Resources - Potential Fossil Yield Classifications .....	1363
Map 71.	Heritage and Visual Resources - Visual Resource Inventory Distance Mapping Zones .....	1363
Map 72.	Heritage and Visual Resources - Visual Resource Inventory Sensitivity .....	1363
Map 73.	Heritage and Visual Resources - Visual Resource Inventory Scenic Quality .....	1363
Map 74.	Heritage and Visual Resources - New (2009) Visual Resource Inventory Classes.....	1363
Map 75.	Heritage and Visual Resources - Existing (1985) Visual Resource Management Classes (Alternative A) .....	1363
Map 76.	Heritage and Visual Resources - Visual Resource Management Classes (Alternative B) .....	1363
Map 77.	Heritage and Visual Resources - Visual Resource Management Classes (Alternative C) .....	1363
Map 78.	Heritage and Visual Resources - Visual Resource Management Classes (Alternative D).....	1363
Map 79.	Heritage and Visual Resources - Regional Historic Trails and Early Highways (Alternatives A, C, and D).....	1363

Map 80.	Heritage and Visual Resources - Regional Historic Trails and Early Highways (Alternative B) .....	1363
Map 81.	Land Resources - Roads in the Planning Area.....	1363
Map 82.	Land Resources - Jeffrey City Area Roads .....	1363
Map 83.	Land Resources - Lander Area Roads.....	1363
Map 84.	Land Resources - Lysite Area Roads .....	1363
Map 85.	Land Resources - Dubois Area Roads.....	1363
Map 86.	Land Resources - 1987 Recreation Opportunity Spectrum .....	1363
Map 87.	Land Resources - Recreation Opportunity Spectrum 2009 Physical Setting.....	1363
Map 88.	Land Resources - Recreation Opportunity Spectrum 2009 Social Setting .....	1363
Map 89.	Land Resources - Recreation Opportunity Spectrum 2009 Operational Setting .....	1363
Map 90.	Land Resources - Recreation Management Areas (Alternative A) .....	1364
Map 91.	Land Resources - Recreation Management Areas (Alternative B) .....	1364
Map 92.	Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative C) .....	1364
Map 93.	Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative D) .....	1364
Map 94.	Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternative A) ..	1364
Map 95.	Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternatives B, C, and D) .....	1364
Map 96.	Land Resources - Wind Energy Potential .....	1364
Map 97.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative A) .....	1364
Map 98.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative B) .....	1364
Map 99.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative C) .....	1364
Map 100.	Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative D) .....	1364
Map 101.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative A) .....	1364
Map 102.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative B).....	1364
Map 103.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative C).....	1364
Map 104.	Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative D) .....	1364
Map 105.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative A) .....	1364
Map 106.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative B) .....	1364
Map 107.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative C) .....	1364
Map 108.	Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative D) .....	1364
Map 109.	Land Resources - Trails and Travel Management (Alternative A) .....	1364
Map 110.	Land Resources - Trails and Travel Management (Alternative B) .....	1364
Map 111.	Land Resources - Trails and Travel Management (Alternative C) .....	1364
Map 112.	Land Resources - Trails and Travel Management (Alternative D) .....	1364

Map 113.	Land Resources - Trails and Travel Management Seasonal Limitation to All Travel (Human Presence) (Alternative D).....	1364
Map 114.	Land Resources - Trails and Travel Management Over-Snow Travel (Alternative A).....	1364
Map 115.	Land Resources - Trails and Travel Management Over-Snow Travel (Alternative B).....	1365
Map 116.	Land Resources - Trails and Travel Management Over-Snow Travel (Alternative D).....	1365
Map 117.	Land Resources - Livestock Grazing (Alternatives A and C).....	1365
Map 118.	Land Resources - Livestock Grazing (Alternative B).....	1365
Map 119.	Land Resources - Livestock Grazing (Alternative D) .....	1365
Map 120.	Land Resources - Recreation Sites .....	1365
Map 121.	Special Designations - Continental Divide National Scenic Trail.....	1365
Map 122.	Special Designations - National Historic Trails Condition Class Ratings .....	1365
Map 123.	Special Designations - National Historic Trails with Associated Sites.....	1365
Map 124.	Special Designations - National Historic Trails (Alternative A) .....	1365
Map 125.	Special Designations - National Historic Trails (Alternative B) .....	1365
Map 126.	Special Designations - National Historic Trails (Alternative C) .....	1365
Map 127.	Special Designations - Heritage Tourism and Recreation Corridor (Alternative D).....	1365
Map 128.	Special Designations - Wilderness Study Areas .....	1365
Map 129.	Special Designations - Suitable Wild and Scenic River Segments (Alternatives A, B, and D).....	1365
Map 130.	Special Designations - Areas of Critical Environmental Concern (Alternative A) .....	1365
Map 131.	Special Designations - Areas of Critical Environmental Concern (Alternative B) .....	1365
Map 132.	Special Designations - Areas of Critical Environmental Concern (Alternative D) .....	1365
Map 133.	Socioeconomic Resources - Tribal Census Tracts in the Wind River Indian Reservation.....	1365
Map 134.	Mineral Resources - Designated Development Area (Alternative D).....	1365
Map 135.	Special Designations - Reference and Education Area (Alternative D) .....	1365
Map 136.	Cumulative Impact Analysis Area - Greater Sage-Grouse.....	1365
Map 137.	Cumulative Impact Analysis Area - Greater Sage-Grouse - Split Estate.....	1365
Map 138.	Cumulative Impact Analysis Area - Fourth Order Hydrologic Units .....	1365
Map 139.	Cumulative Impact Analysis Area - Wyoming Basin Ecoregion and Continental Divide National Scenic Trail .....	1365
Map 140.	Cumulative Impact Analysis Area - National Historic Trail .....	1366
Map 141.	Lands Proposed for Exchange by Members of the Public.....	1366
Map 142.	General Location Names .....	1366
Map 143.	Mineral Resources - Areas with Master Leasing Plans (Alternative D) .....	1366
Map 144.	Mineral Resources - Modifications to Oil and Gas Management (Alternative D) .....	1366

# Glossary

**Allotment:**

An area of land where one or more livestock operators graze their livestock. Allotments are Bureau of Land Management (BLM)-administered lands, but may also include other federally managed, state-owned, and private lands. An allotment may include one or more separate pastures. Livestock numbers and periods of use are specified for each allotment. Allotments are classified by the following:

Category I – Improve Existing Resource Conditions. Criteria for placing allotments into this category include: (1) present range condition is unsatisfactory and where range condition is expected to decline further; (2) present grazing management is not adequate; (3) the allotment has potential for medium to high vegetative production but production is low to moderate; (4) resource conflicts/controversy with livestock grazing are evident; (5) there is potential for positive economic return on public investment.

Category M – Maintain Existing Resource Conditions. Criteria for placing allotments into this category include: The category for allotments where (1) the present range condition and management are satisfactory with good to excellent condition and will be maintained under present management, or fair condition and improving with improvement expected to continue under present management, or opportunities for BLM management are limited because percentage of public land is low or acreage of public lands is small; (2) the allotment has a potential for moderate or high vegetative production and is producing at or near this potential; (3) there are no significant land-use resource conflicts with livestock grazing; (4) land ownership status may or may not limit management opportunities; (5) opportunities for positive economic return from public investment may exist.

Category C – Custodial Management. Criteria for placing allotments into this category include: The category for allotments where (1) present range condition is not in a downward trend; (2) the allotment has a low vegetative production potential and is producing near this level; (3) there may or may not be limited conflicts between livestock grazing and other resources; (4) present management is satisfactory or is the only logical management under existing conditions; and (5) opportunities for a positive economic return on public investments do not exist.

**Analysis Area:**

Any lands, regardless of jurisdiction, for which the BLM synthesizes, analyzes, and interprets data for information that relates to planning for BLM-administered lands.

**Animal Unit Month:**

A standardized measurement of the amount of forage necessary for the sustenance of one cow unit or its equivalent for 1 month (approximately 800 pounds of forage).

**Appropriate Management Response:**

Any specific action suitable to meet Fire Management Unit objectives. Typically, the Appropriate Management Response (AMR) ranges across a spectrum of tactical options

(from monitoring to intensive management actions). The AMR is developed by using Fire Management Unit strategies and objectives identified in the Fire Management Plan.

**Areas Administratively Unavailable to Leasing:**

BLM Handbook H-1601-1 – Land Use Planning, Appendix C uses the term areas closed to oil and gas leasing. Areas administratively unavailable or closed to oil and gas leasing are areas where it has been determined that other land uses or resource values cannot be adequately protected with even the most restrictive oil and gas leasing stipulations; appropriate protection can be ensured only by making the areas administratively unavailable to oil and gas leasing for the life of the plan. Lands currently under lease would remain leased for the life of the leases. After expiration of these leases, no lands would be available for lease.

**Authorized Officer:**

A manager/supervisor at a BLM Field Office, District Office, or State Office who has been delegated to take action pursuant to the various provisions of Title 43 Code of Federal Regulations – Public Lands.

**Authorized Surface-disturbing Activities:**

Public Land resource uses/activities that disturb the endemic vegetation, surface geologic features, and/or surface/near surface soil resources beyond ambient site conditions that are permitted by previously-approved management actions. Examples of surface-disturbing activities include: construction of well pads and roads, pits and reservoirs, pipelines and powerlines, and most types of vegetation treatments (e.g., prescribed fire, etc.). NOTE: Some resource uses, commodity production and other actions that remove vegetative growth, geologic materials, or soils (e.g., livestock grazing, wildlife browsing, timber harvesting, sand and gravel pits, etc.) are allowed, and in some instances formally authorized, on the public lands. When utilized as a land use restriction, (e.g., No Surface-Disturbing Activities), this phrase prohibits all resource use or activity, except those uses and activities that are specifically authorized, likely to disturb the endemic vegetation, surface geologic features, and surface/near surface soils.

**Big Game Crucial Winter Range:**

Winter habitat on which a wildlife species depends for survival. Because of severe weather conditions or other limiting factors, no alternative habitat would be available.

**Borrow Material:**

A term used in conjunction with construction. The term refers to unprocessed material excavated from a borrow pit for use as fill at another location.

**Carbon Dioxide Flood:**

A carbon dioxide flood is an enhanced oil recovery technique that injects fluid into the reservoir. When carbon dioxide is injected, it mixes with the oil and the two compounds dissolve into one another. The injected carbon dioxide acts as a solvent to overcome forces that trap oil in tiny rock pores and helps sweep the immobile oil left behind after the effectiveness of water injection decreases, resulting in increased oil production.

**Casual Use:**

Activities that do not cause any appreciable disturbance or damage to the public land or resources or existing improvements on that land are considered casual use.



**Cheatgrass:**

Cheatgrass is an annual grass that forms tufts up to 2 feet tall. The leaves and sheaths are covered in short, soft hairs. The flowers occur as drooping, open, terminal clusters that can have a greenish, red, or purple hue. Flowering occurs in the early summer. These annual plants will germinate in fall or spring (fall is more common), and senescence usually occurs in summer. Cheatgrass invades rangelands, pastures, prairies, and other open areas. Cheatgrass has the potential to completely alter the ecosystems it invades. It can completely replace native vegetation and change fire regimes and is most problematic in areas of the western United States with lower precipitation levels.

**Class II Wells:**

Injection wells that are:

- (1) Brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production, and may be commingled with wastewaters from gas plants, which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.
- (2) For enhanced recovery of oil or natural gas.
- (3) For storage of hydrocarbons that are liquid at standard temperature and pressure.

**Class I Wells:**

Injection wells that are:

- (1) Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within ¼ mile of the wellbore, an underground source of drinking water.
- (2) Other industrial and municipal disposal wells that inject fluid beneath the lowermost formation containing, within ¼ mile of the wellbore, an underground source of drinking water.
- (3) Radioactive waste disposal wells that inject fluid below the lowermost formation containing, within ¼ mile of the wellbore, an underground source of drinking water.

**Closed:**

Generally denotes that an area is not available for a particular use or uses; refer to specific definitions found in law, regulations, or policy guidance for application to individual programs.

**Commodity:**

An economic good, such as a product of agriculture or mining.

**Commodity Production:**

The materialization of an economic good, such as a product of agriculture or mining.

**Communication Site Management Plan:**

A plan that provides for effective administration of a communications site. The site plan defines the principles and technical standards adopted in the site designation. The site plan

provides direction for the day-to-day operations of the site in connection with the lease. The site plan shall delineate the types of uses that are appropriate at this site and the technical and administrative requirements for management of the site. The site plan should reflect the complexity of the current situation and the anticipated demand for the site.

**Comprehensive Grazing Management Strategy:**

A strategy that incorporates a documented grazing prescription that tailors the timing and intensity (utilization) of grazing to specific vegetation objectives. The grazing prescription is clearly linked to the physiological requirements of the species intensified in the objectives. Objectives are established for locations preferred by livestock. A Comprehensive Grazing Management strategy gives specific attention to the critical growing season on upland ranges and the hot season in riparian-wetland habitat. The kind and class of livestock along with the season of use will affect the timing and intensity requirements.

**Comprehensive Weed Management Plan:**

A plan for controlling invasive plant species that incorporates integrated weed management techniques and accounts for pertinent considerations, such as management actions and allocations affecting weeds.

**Congressionally Designated Trails:**

In 1968, the National Trails System Act (NTSA) (Public Law 90-543) provided for the development of a national system of trails in urban, rural, and wilderness settings. Originally, the NTSA specified three categories of national trails: National Scenic Trails (NSTs), recreation trails, and connecting or side trails. In 1978, historic trails were added as another category. Today, only Congress can designate National Historic Trails (NHTs) and NSTs. Congressionally Designated Trails in the planning area include the Continental Divide NST and the Oregon, Mormon Pioneer, California, and Pony Express NHTs. Management of Congressionally Designated Trails is guided by Instruction Memorandum 2009-215 (Planning for Special Designations within the National System of Public Lands).

**Controlled Surface Use:**

Surface occupancy or use will be restricted or prohibited unless the operator and surface managing agency arrive at an acceptable plan for mitigation of anticipated impacts. Identified resource values require special operational constraints that may modify the lease rights. Controlled surface use is used for operating guidance, not as a substitute for the No Surface Occupancy or Timing Limitation Stipulations.

**Cooperative Monitoring:**

Joint monitoring by more than one entity.

**Core Area:**

Executive Order 2008-2, issued by the Governor of Wyoming, delineated a Core Area to protect populations of greater sage-grouse in the state. The Order also outlines restrictions on the density of future development and other human activities that limit impacts to sage-grouse populations.

**Cultural Resource Inventory Levels:**

A three-tiered process for discovering, recording, and evaluating cultural resources.

(a) Class I – A review of existing literature and oral informant data combined with an analysis of a specific geographic region (e.g., an area of potential effect, drainage basin, resource area, etc.).

(b) Class II – A sampling survey usually aimed at developing and testing a predictive model of cultural resource distribution.

(c) Class III – An on-the-ground survey to discover, record, and evaluate cultural resources within a specific geographic area (e.g., usually an area of potential effect for a proposed undertaking).

**Decibel (dB):**

A unit of measurement of the loudness or strength of a signal. One decibel is considered the smallest difference in sound level that the human ear can discern. Decibels are a relative measurement derived from two signal levels; a reference input level and an observed output level. A decibel is the logarithm of the ratio of the two levels. One Bel is when the output signal is 10x that of the input and one decibel is 1/10th of a Bel.

**Designated Roads and Trails:**

Specific roads and trails on which some type of motorized vehicle use is allowed, either seasonally or year-long.

**Desired Plant Community:**

Of the several plant communities that may occupy a site, the desired plant community is the community that has been identified through a management plan to best meet the plan's objectives for the site. At a minimum, it must protect the site.

**Disruptive Activities:**

Those public land resource uses/activities that are likely to alter the behavior, displace, or cause excessive stress to existing animal or human populations occurring at a specific location and/or time. In this context, disruptive activity(ies) refers to those actions that alter behavior or cause the displacement of individuals such that reproductive success is adversely affected, or an individual's physical ability to cope with environmental stress is compromised. This term does not apply to the physical disturbance of the land surface, vegetation, or features. Examples of disruptive activities may include noise, human foot or vehicle traffic, domestic livestock roundups, or other human presence regardless of the activity. When administered as a land use restriction (e.g., No Disruptive Activities), this term may prohibit or limit the physical presence of sound above ambient levels, light beyond background levels, and/or the nearness of people and their activities. The term is commonly used in conjunction with protecting wildlife during crucial life stages (e.g., breeding, nesting, birthing, etc.), although it could apply to any resource value on the public lands. The use of this land use restriction is not intended to prohibit all activity or authorized uses.

**Downspacing:**

Decreasing the number of oil and/or gas wells in a given area.

**Ecological Integrity:**

The condition of an unimpaired ecosystem as measured by combined chemical, physical (including physical habitat), and biological attributes.

**Ecological Site:**

A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in that the site has the ability to produce distinctive kinds and amounts of vegetation and to respond to management. Ecological sites are defined and described with information about soil, species composition, and annual production.

**Ephemeral Stream:**

A stream that flows only in direct response to precipitation, and whose channel is at all times above the water table. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's suggestion that the term "ephemeral" be arbitrarily restricted to streams that do not flow continuously for at least 30 days (Prichard et al. 1998). Ephemeral streams support riparian-wetland areas when streamside vegetation reflects the presence of permanent subsurface water.

**Exceedance:**

An event in which measurements of ambient air quality are above the National Ambient Air Quality standard (NAAQS) or Wyoming Department of Environmental Quality (DEQ) standard set for a particular pollutant. For example, an annual average nitrogen dioxide value of 110 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) is an exceedance of both the NAAQS and Wyoming DEQ annual average standard for nitrogen dioxide of 100  $\mu\text{g}/\text{m}^3$ .

**Exception:**

A one time exemption for a particular site within an oil and gas leasehold. Exceptions are determined on a case-by-case basis and the stipulation continues to apply to all other sites within the leasehold.

**Exclusion Areas:**

An area on public lands where a certain activity is prohibited to insure protection of other resource values present on the site. The term is frequently used in reference to lands and realty actions and proposals (e.g., rights-of-way), but is not unique to the lands and realty program.

**Extensive Recreation Management Areas:**

These are areas where dispersed recreation is encouraged and where visitors have a freedom of recreational choice with minimal regulatory constraint.

**Fire Management Plan:**

Identifies appropriate strategies to achieve resource objectives. Identifies fire policy, objectives, and prescribed actions; may include maps, charts, tables, and statistical data.

**Fire Regime Condition Class:**

A classification of the amount of departure from the natural fire regime. The departure results in changes to one or more of the following ecological components: vegetation characteristics (e.g., species composition, structural stages, stand age, canopy closure, and mosaic pattern), fuel composition, fire frequency, severity, and pattern, and other associated disturbance (e.g., insect and disease mortality, grazing, and drought). The three condition classes are listed below.

(a) Condition Class 1

- The historic disturbance regime is largely intact and functioning (e.g., has not missed a fire return interval).
- Potential intensity and severity of fire within historic range.
- Effects of disease and insects within historic range.
- Hydrologic functions within normal historic range.
- Vegetation composition and structure resilient to disturbances.
- Nonnative species currently not present or to a limited extent.
- Low risk of loss for key ecosystem components.

(b) Condition Class 2

- Moderate alterations to historic disturbance regime evident (e.g., missed one or more fire return intervals).
- Effects of disease and insects pose an increased risk of loss of key community components.
- Riparian-wetland areas and associated hydrologic function show measurable signs of adverse departure from historic conditions.
- Vegetation composition and structure shifted toward conditions less resilient to disturbances.
- Populations of nonnative species may have increased, increasing the risk of further increases following disturbance.

(c) Condition Class 3

- Historic disturbance regime significantly altered; historic disturbance processes and impacts may be precluded (e.g., missed several fire return intervals).
- Effects of disturbance (fire, insects, and disease) may cause significant or complete loss of key community components.
- Hydrologic functions may be adversely altered; high potential for increased sedimentation and reduced streamflows.
- Invasive, nonnative species may be common and in some cases the dominant species on the landscape; disturbance will likely increase both the dominance and geographic extent of these invasive species.
- Highly altered vegetation composition and structure predisposes community to disturbance events outside the range of historic availability; disturbance may have effects not observed or measured before.

**Fire Return Interval:**

The number of years between two successive fire events at a specific site or area.

**Flaring/Venting:**

The controlled burning (flare) or release (vent) of natural gas that cannot be processed for sale or use because of technical or economic reasons.

**Floodplain Connectivity:**

Maintenance of lateral, longitudinal, and vertical pathways for biological and hydrological processes in the floodplain. Examples of failures to maintain connectivity could include culverts or levees that restrict flow in the floodplain and that focus overbank flow into the channel.

**Flushing Livestock:**

Flushing livestock is the holding of livestock in an invasive, nonnative plant species seed-free area where they are fed an invasive, nonnative plant species seed-free ration for 72 hours, thus flushing invasive, nonnative plant species seed from the animals' digestive systems.

**Foreground-Middle Ground Zone:**

An area that can be seen from a travel route for a distance of 3 miles (foreground) to 5 miles (middle ground) where management activities might be viewed. A distance from 5 to 15 miles is called the Background Zone and the area beyond 15 miles is called the Seldom-Seen Zone.

**Geologic Resources:**

Resources associated with the scientific study of the Earth, including its composition, structure, physical properties, and history. Geologic resources commonly include the study of minerals (mineralogy) and rocks (petrology), the structure of the Earth (structural geology) and volcanic phenomena (volcanology), and landforms and the processes that produce them (geomorphology and glaciology).

**Goal:**

A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established timeframes for achievement.

**Guzzler:**

A water development for wildlife.

**Heavy Equipment Use:**

This phrase is used in fire management and is relative to limiting fire suppression tactics. In this context it refers to not using dozers, skidders, or graders in areas where important resource values are in need of protection. Fire engines and water tenders used during suppression activities would be allowed.

**Held by Production:**

Leases that become productive and do not terminate until all wells on the lease have ceased production.

**Historic American Buildings Survey/Historic American Engineering Record:**

The Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) is an integral component of the federal government's commitment to historic preservation. The program documents important architectural, engineering and industrial sites throughout the United States and its territories. A complete set of HABS/HAER documentation, consisting of measured drawings, large-format photographs, and written history plays a key role in accomplishing the mission of creating an archive of American

architecture and engineering and in better understanding what historic resources tell us about America's diverse ethnic and cultural heritage. To insure that such evidence is not lost to future generations, the HABS/HAER Collections are archived at the Library of Congress, where they are made available to the public.

**Hot Season:**

The part of the grazing season that occurs during the hot part of the summer between June 15 and August 31.

**Hummocking:**

A small, rounded or cone-shaped, low hill or a surface of other small, irregular shapes.

**Impact Analysis for Planning 2000 Model:**

Impact Analysis for Planning (IMPLAN) 2000 Model is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the "ripple effect" (also called the "multiplier effect") of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly affected) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

**Important Wildlife Habitat:**

Big game crucial winter range, big game parturition areas, designated critical migration corridors, sage-grouse breeding and nesting areas, raptor concentration areas, and critical fish spawning areas.

**Integrated Pest Management:**

Ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism.

**Integrated Weed Management:**

The use of all appropriate weed control measures, including fire, as well as mechanical, chemical, biological, and cultural techniques, in an organized and coordinated manner on a site-specific basis.

**Intermittent Stream:**

A stream that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's suggestion that the term "intermittent" be arbitrarily restricted to streams that flow continuously for periods of at least 30 days (Prichard et al. 1998).

**Land Tenure:**

To improve the manageability of the BLM-administered lands and improve their usefulness to the public, the BLM has numerous authorities for "repositioning" lands into a more consolidated pattern, disposing of lands, and entering into cooperative management

agreements. These land-pattern improvements are completed primarily through the use of land exchanges, but also through land sales, jurisdictional transfers to other agencies, and through the use of cooperative management agreements and leases. These ownership or jurisdictional changes are referred to as “Land Tenure Adjustments.”

**Laramide Orogeny:**

The Laramide orogeny (orogeny is the Greek word for mountain building) was a period of mountain building in western North America which began during the Late Cretaceous period, 70 to 80 million years ago, and ended 35 to 55 million years ago. The major feature that was created by this orogeny was the Rocky Mountains, but evidence of this period is found from Alaska to Mexico and as far east as the Black Hills. The phenomenon is named for the Laramie Mountains of eastern Wyoming.

**Leasable Minerals:**

Those minerals or materials subject to lease by the federal government under the Mineral Leasing Act of 1920. They include coal, phosphate, asphalt, sulphur, potassium, and sodium minerals; oil and gas, as well as geothermal resources.

**Locatable Minerals:**

Minerals subject to exploration, development, and disposal by staking mining claims as authorized by the Mining Law of 1872, as amended. This includes deposits of metallic minerals such as gold, silver, and other uncommon materials not subject to lease or sale.

**Mechanized Travel:**

Moving by means of a mechanical device, such as a bicycle, and not powered by a motor.

**Mineral Materials:**

Materials such as common varieties of sand, stone, gravel, pumice, pumicite, and clay that are not obtainable under the mining or leasing laws, but can be acquired under the Mineral Materials Act of 1947, as amended. Also known as salable minerals.

**Mineral Withdrawal:**

A formal order that withholds federal lands and minerals from entry under the Mining Law of 1872, as amended, and closes the area to mineral location (i.e., staking mining claims) and development.

**Mitigation:**

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- (e) Compensating for the impact by replacing or providing substitute resources or environments.



**Modern Intrusions:**

Includes not only the intrusion but also related impacts, such as a water well. Related impacts could include livestock trails to the well and un-reclaimed roads leading to it.

**Motorized Use:**

Use of public lands by means of vehicles that are propelled by motors, such as cars, trucks, off-highway vehicles (OHVs), motorcycles, etc.

**Multiple Use Reservoir:**

A human-created lake or pond with a combination of balanced uses, including, but not limited to, recreation, livestock watering, watershed health, and wildlife and fish.

**Native Species Status:**

Native Species Status (NSS) refers to the population status of species native to the area in which their habitats occur. The NSSs are divided into the following categories:

## NSS1

- Populations are greatly restricted or declining, extirpation appears possible; or ongoing significant loss of habitat.

## NSS2

- Populations are declining, extirpation appears possible; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance.

## OR

- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; ongoing significant loss of habitat.

## NSS3

- Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable, but no loss; species is not sensitive to human disturbance.

## OR

- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance.

## OR

- Species is widely distributed; population status or trends are unknown, but are suspected to be stable; ongoing significant loss of habitat.

## NSS4

- Populations are greatly restricted or declining, extirpation appears possible; habitat is stable and not restricted.

OR

- Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is not restricted, vulnerable, but no loss; species is not sensitive to human disturbance.

OR

- Species is widely distributed, population status or trends are unknown, but are suspected to be stable; habitat is restricted or vulnerable, but no recent or ongoing significant loss; species may be sensitive to human disturbance.

OR

- Populations that are stable or increasing and not restricted in numbers and/or distribution; ongoing significant loss of habitat.

#### **Natural Fire Regime:**

The general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (National Wildfire Coordinating Group 2003).

#### **Necessary Tasks:**

Temporary excursions leaving existing vehicular routes are permitted only to accomplish necessary tasks. Necessary tasks are actions that support commercial or industrial uses of public lands, which need to be accomplished by a person or organization seeking or holding authorization from the BLM to build, maintain, or place infrastructure necessary to achieve planning goals and objectives, or exercise valid existing rights. Tasks associated with such activities typically require motorized vehicles to haul materials, tools, and equipment to the project site.

The majority of necessary tasks will occur as a result of a BLM authorization. At the time of project authorization, offices will assume and analyze a level of motorized vehicle use for construction and maintenance. It is feasible that a new road will develop as a result of the exemption, and therefore offices should consider if this new road will be open to the public, only for administrative access, or reclaimed. Additional mitigation measures may be necessary to reduce motorized vehicle impacts. Mitigation measures pertaining to the necessary task exemption will be included in the terms and conditions, Conditions of Approval, or stipulations. Monitoring and evaluation will be conducted at these known locations.

Sometimes necessary tasks (as defined above) are and will be accomplished without formal written approval or in advance of receiving an authorization. Cross-country OHV travel in these cases is authorized so long as resource damage does not occur. While generally defined, the determination of whether resource damage has occurred is left to the discretion of field managers and law enforcement personnel. For this reason, project proponents are encouraged to contact their local field offices prior to using OHVs cross-country, so as to ensure use will not cause resource damage. In addition, project proponents must notify the BLM in writing when and where cross-country travel has occurred prior to an authorization. This can be done at the application phase, but must occur prior to final authorization.

Other Authorizations and Uses:

It is recognized that in many cases, cross-country motorized vehicle use is the most efficient tool for operators and industry to achieve BLM (Planning/Resource/Statutory) objectives and requirements. Livestock herding, scientific studies, habitat treatments, etc., are all examples of actions that may require cross-country motorized vehicle travel. In these cases, the project proponent is expected to submit a request for exemption from travel management regulations. The request for exemption will contain the following elements:

1. Who? Name of company, individuals, agency, and/or other entities traveling cross-country.
2. Description of proposed action and why the action is necessary to achieve agency objectives?
3. Type of motorized vehicle to be used and description of how the vehicle will be used for the proposed action?
4. A map with specific areas where projected cross-country travel is necessary?
5. Season, frequency, and duration of cross-country travel.
6. Why this action can't be accomplished using nonmotorized conveyances (e.g., horses)?
7. Expected outcome if this authorization is granted? Expected outcome if this authorization is not granted?
8. Methods and measures to minimize resource damage?
9. Other information.

Waivers/authorizations will be conditional upon consistency with Land Use and Activity Level planning decisions and other BLM objectives. The project proponent is encouraged to be as detailed as possible in the application for exception. The BLM will consider an application for exception complete when the information provided is sufficient to facilitate impact analysis, enforcement, monitoring, and evaluation. Project proponents are encouraged to submit the waiver request in tandem with other applications, renewals, or proposals, but the agency will accept the applications at all times. Waiver applications will not be accepted for individuals that are being actively investigated for violation of a OHV rule. Waivers and authorizations will not be granted to individuals who have been convicted of an OHV violation.

Any and all individuals conducting cross-country travel under such a waiver or authorization will carry a copy of the waiver and conditions associated with the waiver. The project proponent associated with the waiver will be required on an annual basis to provide an 'actual occurrence' report that documents the location (legal description), time, and date of each and all incidents where motorized vehicles were used to travel cross-country or off-road.

Failure to adequately document all occurrence of cross-country or off-road travel will result in termination of the waiver. Upon evaluation and monitoring, if it is determined that unacceptable conditions or resource damage is occurring, the waiver may be revoked. Additionally, if an evaluation shows no increased progress towards objectives and/or requirements (part 2 of the request information) then the waiver can be revoked.

### **No Surface Occupancy:**

The term "no surface occupancy" is used in two ways. It is used in one way to define a no surface occupancy (NSO) area where no surface-disturbing activities of any nature or for any purpose would be allowed. For example, construction or the permanent or long-term placement of structures or other facilities for any purpose would be prohibited in an NSO area.

The other way the "no surface occupancy" term is used is as a stipulation or mitigation requirement for controlling or prohibiting selected land uses or activities that would conflict

with other activities, uses, or values in a given area. When used in this way, the NSO stipulation or mitigation requirement is applied to prohibit one or more specific types of land and resource development activities or surface uses in an area, while other – perhaps even similar – types of activities or uses (for other purposes) would be allowed. For example, protecting important rock art relics from destruction may require closing the area to the staking of mining claims and surface mining, cross-country vehicle travel, construction or long-term placement of structures or pipelines, powerlines, general purpose roads, and livestock grazing. Conversely, the construction of fences to protect the rock art from vandalism or from trampling or breakage by livestock, an access road or trail, and other visitor facilities to provide interpretation and opportunity for public enjoyment of the rock art would be allowed. Further, if there were interest in development of leasable minerals in the area, leases for oil and gas, coal, and so forth, could be issued with a “no surface occupancy” stipulation or mitigation requirement for the rock art site, which would still allow access to the leasable minerals from adjacent lands and underground. The term “no surface occupancy” has no relationship or relevance to the presence of people in an area.

**Objective:**

A description of a desired condition for a resource. Objectives can be quantified and measured and, where possible, have established timeframes for achievement.

**Occupied Lek:**

A lek that has been active during at least one strutting season within the last 10 years.

**Off-highway Vehicle:**

Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding: (1) any nonamphibious registered motorboat; (2) any military, fire, emergency, or law enforcement vehicle being used for emergency purposes; (3) any vehicle whose use is expressly authorized by the Authorized Officer, or otherwise officially approved; (4) vehicles in official use; and (5) any combat or combat support vehicle when used in times of national defense emergencies.

**Off-highway Vehicle Management Designations:**

Designations apply to all OHVs regardless of the purposes for which they are being used. Emergency vehicles are excluded. The OHV designation definitions have been developed in cooperation with representatives of the U.S. Forest Service, National Park Service, and the BLM state and field office personnel. The BLM recognizes the differences between OHVs and over-snow vehicles in terms of use and impact. Therefore, travel by over-snow vehicles will be permitted off existing routes and in all open or limited areas (unless otherwise specifically limited or closed to over-snow vehicles) if they are operated in a responsible manner without damaging the vegetation or harming wildlife.

**Closed:**

Vehicle travel is prohibited in the area. Access by means other than motorized vehicle is permitted. This designation is used if closure to all vehicular use is necessary to protect resources, to ensure visitor safety, or to reduce conflicts.

**Open:**

Vehicle travel is permitted in the area (both on and off roads) if the vehicle is operated responsibly in a manner not causing, or unlikely to cause, significant undue damage to or disturbance of the soil, wildlife, wildlife habitats, improvements, cultural or vegetative resources, or other authorized uses of the public lands. These areas are used for intensive OHV use where there are no compelling resource needs, user conflicts, or public safety issues to warrant limiting cross-country travel.

Limited:

(a) Vehicle travel is permitted only on roads and vehicle routes which were in existence prior to the date of designation in the *Federal Register*. Vehicle travel off of existing vehicle routes is permitted only to accomplish necessary tasks and only if such travel does not result in resource damage. Random travel from existing vehicle routes is not allowed. Creation of new routes or extensions and/or widening of existing routes are not allowed without prior written agency approval.

(b) Vehicle travel is permitted only on roads and vehicle routes designated by the BLM. In areas where final designation has not been completed, vehicle travel is limited to existing roads and vehicle routes as described above. Designations are posted as follows:

1. Vehicle route is open to vehicular travel.
2. Vehicle route is closed to vehicular travel.

(c) Vehicle travel is limited by number or type of vehicle. Designations are posted as follows:

1. Vehicle route limited to four-wheel drive vehicles only.
2. Vehicle route limited to motorbikes only.
3. Area is closed to over-snow vehicles.

(d) Vehicle travel is limited to licensed or permitted use.

(e) Vehicle travel is limited to time or season of use.

(f) Where specialized restrictions are necessary to meet resource management objectives, other limitations also may be developed.

The BLM may place other limitations, as necessary, to protect other resources, particularly in areas that motorized OHV enthusiasts use intensely or where they participate in competitive events.

**Offsite Mitigation:**

Mitigation located away from the adversely affected site.

**Open:**

Generally denotes that an area is available for a particular use or uses. Refer to specific program definitions found in law, regulations, or policy guidance for application to individual programs.

**Overgrazing:**

Continued heavy grazing that exceeds the recovery capacity of the forage plants and creates deterioration of the grazing lands (Valentine 1990).

**Over-snow Vehicle:**

An over-snow vehicle is a motor vehicle that is designed for use over snow that runs on a track or tracks and/or a ski or skis. An over-snow vehicle does not include machinery used strictly for the grooming of nonmotorized trails.

**Perennial Stream:**

A stream that flows continuously. Perennial streams generally are associated with a water table in the localities through which they flow (Prichard et al. 1998).

**Pest:**

With the exception of vascular plants classified as invasive nonnative plant species, a pest can be any biological life form that poses a threat to human or ecological health and welfare. For the purposes of this planning effort, an “animal pest” is any vertebrate or invertebrate animal subject to control by Animal and Plant Health Inspection Service (APHIS). APHIS is currently the BLM’s authorized agent for controlling “animal pests.” For this reason, “animal pests” will be considered a subset of Pest.

**Planned Ignition:**

The intentional initiation of a wildland fire by hand-held, mechanical, or aerial device, where the distance and timing between ignition lines or points and the sequence of igniting them is determined by environmental conditions (weather, fuel, topography), firing technique, and other factors which influence fire behavior and fire effects (see *Prescribed Fire*).

**Planning Area:**

A geographic area for which land use and resource management plans are developed and maintained.

**Potential Fossil Yield Classification:**

Geologic units in the planning area are classified according to the Potential Fossil Yield Classification, usually at the formation or member level, according to the probability of yielding resources of concern to land managers, primarily vertebrate fossils. The classification uses a ranking of 1 through 5, with Class 5 assigned to units with a high potential for fossils. Within the planning area, Class 4 and Class 5 geologic formations account for approximately 50 percent of the total acreage, including all ownerships. About 35 percent of public land in the planning area is underlain by Class 4 and Class 5 formations. The classifications are described as below:

Class 1. Igneous and metamorphic geologic units, or units with highly disturbed preservational environments that are not likely to contain recognizable fossil remains. Management concern is negligible for Class 1 resources and mitigation requirements are rare.

Class 2. Sedimentary geologic units that are not likely to contain vertebrate fossils or significant nonvertebrate fossils. Management concern is low for Class 2 resources and mitigation requirements are not likely.

Class 3. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence, or units of unknown fossil potential. Management concern may extend across the entire range of management. Ground-disturbing activities require sufficient assessment to determine whether significant resources occur in the area of the proposed action.

Class 4. Class 4 units are Class 5 units with a lowered risk of human-caused adverse impacts or lowered risk of natural degradation. Ground-disturbing activities require assessment to determine whether significant resources occur in the area of the proposed action and whether those actions will impact the resource. Mitigation may include full monitoring of significant localities.

Class 5. Highly fossiliferous geologic units that regularly produce vertebrate fossils or significant nonvertebrate fossils and that are at risk of natural degradation or human-caused adverse impacts. Class 5 areas receive the highest level of management focus. Mitigation of ground-disturbing actions is required and may be intense. Areas of special interest may be designated and intensely managed.

**Potential Natural Community:**

The biotic community that would become established if all successional sequences were completed without interference by humans under the present environmental conditions. Natural disturbances are inherent in development. Potential natural community includes naturalized nonnative species.

**Prairie Dog “Complex”:**

Defined as a cluster of two or more prairie dog towns within 3 kilometers of each other (Clark and Stromberg 1987), and bounded by either natural or artificial barriers (Whicker and Detling 1988), which effectively isolate one cluster of colonies from interacting/interchanging with another. Prairie dogs may commonly move among colonies of a cluster, and thereby foster reproductive/genetic viability, but exhibit little emigration/immigration between clusters. A cluster may include some currently unoccupied, through physically suitable (i.e., vegetation, soils, topography, etc.), land immediately adjacent to occupied colonies that support other prairie dog-associated (ecosystem function), obligate or facultative species (e.g., swift fox, mountain plover, burrowing owl, etc.).

**Prescribed Burning:**

Controlled application of fire to wildland fuels in either their natural or modified state under specified environmental conditions that allow the fire to be confined to a predetermined area, and at the same time, to produce the fire intensity and rate of spread required to attain planned resource management objectives.

**Prescribed Fire:**

A wildland fire originating from a planned ignition to meet specific objectives identified in a written, approved, prescribed fire plan for which National Environmental Policy Act requirements (where applicable) have been met prior to ignition.

**Priority Fish Species:**

Species considered to be sport fish and native species.

**Produced Water:**

Groundwater removed to facilitate the extraction of minerals, such as coal, oil, or gas.

**Proper Functioning Condition:**

The on-the-ground condition of a riparian-wetland area, referring to how well the physical processes are functioning and the state of resiliency that will allow a riparian-wetland area to hold together during a high-flow event, sustaining that system's ability to produce values related to both physical and biological attributes.

**Proper Grazing:**

Proper grazing is the practice of managing forage use by grazing animals at a sustainable level that maintains rangeland health. Proper grazing will maintain or increase plant cover, including residue, which acts to slow down or reduce runoff, increase water infiltration, and keep erosion and sedimentation at or above acceptable levels within the potential of ecological sites within a given geographic area (e.g., watershed, grazing allotment, etc.).

**Range Improvement Project:**

A structural improvement requiring placement or construction to facilitate management or control distribution and movement of grazing or browsing animals. Such improvements may include, but are not limited to, fences, wells, troughs, reservoirs, water catchments, pipelines, and cattleguards. The project also may include a practice or treatment which improves rangeland condition and or resource production for multiple use. Nonstructural types of projects may include, but are not limited to, seeding and plant control through chemical, mechanical, and biological means or prescribed burning.

**Rangeland:**

Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing. This includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

**Rangeland Health:**

The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained.

**Raptor:**

Bird of prey with sharp talons and a strongly curved beak, such as hawks, falcons, owls, vultures, and eagles.

**Recreational Outcomes:**

The beneficial and non-beneficial consequences (i.e., outcomes) of the management and use of recreation and related amenity resources and programs (Driver 2008).

**Recreational Use:**

The public is allowed to pursue recreational (e.g., picking up big game kills, camping, parking) activities up to 300 feet away from roads and trails, as long as such activities do not cause resource damage or create new roads or extend existing roads. The existing road system



and this cross-country travel allowance is designed to accommodate the needs of recreational activities on the public lands. This applies only to all “Limited” travel designations.

**Recreation Management Areas:**

Units within a planning area that guide recreation management on public lands having similar recreation related issues and concerns. There are two types of recreation management areas; extensive and special.

Extensive Recreation Management Areas: These are areas where dispersed recreation is encouraged and where visitors have a freedom of recreational choice with minimal regulatory constraint.

Special Recreation Management Areas: These are areas where congressionally recognized recreation values exist or where significant public recreation issues or management concerns occur. Special or more intensive types of management are typically needed.

**Responsible Official:**

The BLM official who has been delegated authority to approve an action by signing a Record of Decision in the matter of an Environmental Impact Statement, or Decision Records in the matter of an Environmental Assessment.

**Restricted Disposal:**

Parcels identified for restricted disposal may be disposed of under the Recreation and Public Purposes Act, by exchange, may limit the disposal to a particular type of entity capable of preserving the resource values, or may include the use of covenants in the deed or land sale patent to ensure the resource values are protected.

**Rights-of-Way:**

A rights-of-way (ROW) grant is an authorization to use a specific piece of public land for a specific project, such as roads, pipelines, transmission lines, and communication sites. The grant authorizes rights and privileges for a specific use of the land for a specific period of time.

**Rights-of-Way Avoidance Areas:**

Areas where adverse routing factors exist. ROWs either will not be granted in these areas, or, if granted, will be subject to stringent terms and conditions. In other words, ROWs would be restricted (but not necessarily prohibited) in these avoidance areas.

**Rights-of-Way Exclusion Area:**

Areas with sensitive resource values where ROW and 302 permits, leases, and easements would not be authorized.

**Riparian Areas:**

Riparian areas are a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, playas, and the shores of lakes and reservoirs with stable water levels, are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

**Riparian-Wetland Functionality Classification:**

**Functional At-Risk:** Riparian-wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

**Proper Functioning Condition (PFC):** A riparian or wetland area is considered to be in PFC when adequate vegetation, landform, or large woody debris is present to do the following:

- Dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality.
- Filter sediment, capture bedload, and aid floodplain development.
- Improve floodwater retention and groundwater recharge.
- Develop root masses that stabilize stream banks against cutting action.
- Develop diverse ponding and channel characteristics to provide the habitats and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses.
- Support greater biodiversity.

**Nonfunctional:** Riparian or wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, and so on, as listed above. The absence of certain physical attributes, such as a floodplain where one should be, are indicators of nonfunctioning conditions.

**Unknown:** Riparian or wetland areas that the BLM lacks sufficient information on to make any form of determination.

**Salable Minerals:**

*See Mineral Materials.*

**Seasonal Ranges:**

The Wyoming Game and Fish Department has identified various ranges for big game species. These ranges are defined as follows:

**Summer or Spring-Summer-Fall:** A population or portion of a population of animals use the documented habitats within this range annually from the end of previous winter to the onset of persistent winter conditions.

**Severe Winter Relief:** A documented survival range, which may or may not be considered a crucial range area as defined above. It is used to a great extent, but only in extremely severe winters. It may lack habitat characteristics that would make it attractive or capable of supporting major portions of the population during normal years, but is used by and allows at least a significant portion of the population to survive the occasional extremely severe winter.

Winter: A population or portion of a population of animals annually use the documented suitable habitat sites within this range in substantial numbers during the winter period only.

Winter/Year-long: A population or a portion of a population of animals makes general use of the documented suitable habitat sites within this range on a year-round basis. During the winter months there is a significant influx of additional animals into the area from other seasonal ranges.

Year-long: A population or substantial portion of a population of animals makes general use of the suitable documented habitat sites within the range on a year-round basis. On occasion, animals may leave the area under severe conditions.

Parturition Areas: Documented birthing areas commonly used by females. They include calving areas, fawning areas, and lambing grounds. These areas may be used as nurseries by some big game species.

**Section 106 of National Historic Preservation Act:**

“The head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. The head of any such federal agency shall afford the Advisory Council on Historic Preservation established under Title II of this Act a reasonable opportunity to comment with regard to such undertaking” (16 United States Code 47 df).

**Sensitive Sites or Resources:**

Sensitive sites or resources refer to significant cultural resources that are, or may be eligible, for nomination to the National Register of Historic Places.

**Sensitive Species:**

Species designated as sensitive by the BLM State Director include species that are under status review, have small or declining populations, live in unique habitats, or require special management. BLM Manual 6840 provides policy and guidance for special status species management. The BLM Wyoming Sensitive Species Policy and List are provided in a memorandum updated annually. Primary goals of the BLM Wyoming policy include maintaining vulnerable species and habitat components in functional BLM ecosystems and preventing a need for species listing under the Endangered Species Act.

**Seral Stage:**

One of a series of plant communities that follows another in time on a specific ecological site.

**Setting:**

Setting is the physical environment of a historic property and how the property evokes a sense of feeling and association with past events. Accordingly, setting refers to the character of the place in which the property played its historic role. It involves how, not just where, the property is situated and its relationship to surrounding features and open space. These

features and their relationships should be considered not only within the exact boundaries of the property, but also between the property and its surroundings.

**Special Recreation Management Areas:**

These are areas where congressionally recognized recreation values exist or where significant public recreation issues or management concerns occur. Special or more intensive types of management are typically needed.

**Special Status Species:**

Special status species are species proposed for listing, officially listed as threatened or endangered, or are candidates for listing as threatened or endangered under the provisions of the Endangered Species Act; those listed by a state in a category such as threatened or endangered, implying potential endangerment or extinction; and those designated by the State Director as sensitive (BLM 2008e).

**Split-estate:**

Surface land and mineral estate of a given area under different ownerships. Frequently, the surface will be privately owned and the minerals federally owned.

**Standards for Healthy Rangelands:**

A description of the physical and biological conditions or degree of function required for healthy, sustainable lands (e.g., land health standards).

**State-listed Species:**

Species proposed for listing or listed by a state in a category implying, but not limited to, potential endangerment or extinction. Listing is either by legislation or regulation.

**Surface-disturbing Activities (or Surface Disturbance):**

The physical disturbance and movement or removal of land surface and vegetation. These activities range from the very minimal to the maximum types of surface disturbance associated with such things as OHV travel or use of mechanized, rubber-tired, or tracked equipment and vehicles; some timber cutting and forest silvicultural practices; excavation and development activities associated with use of heavy equipment for road, pipeline, powerline and other types of construction; blasting; strip, pit, and underground mining and related activities, including ancillary facility construction; oil and gas well drilling and field construction or development and related activities; range improvement project construction; and recreation site construction.

**Surface Water Classes and Uses:**

The following water classes are a hierarchical categorization of waters according to existing and designated uses. Except for Class 1 waters, each classification is protected for its specified uses plus all the uses contained in each lower classification. Class 1 designations are based on value determinations rather than use support and are protected for all uses in existence at the time of or after designation. There are four major classes of surface water in Wyoming with various subcategories within each class.

- (a) Class 1, Outstanding Waters. Class 1 waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. Pursuant to Section 7 of these regulations, the water quality and physical and

biological integrity that existed on the water at the time of designation will be maintained and protected. In designating Class 1 waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archeological, fish and wildlife, the presence of substantial quantities of developable water, and other values of present and future benefit to the people.

(b) Class 2, Fisheries and Drinking Water. Class 2 waters are waters, other than those designated as Class 1 that are known to support fish or drinking water supplies or where those uses are attainable. Class 2 waters may be perennial, intermittent, or ephemeral and are protected for the uses indicated in each subcategory listed below. Five subcategories of Class 2 waters exist.

(c) Class 3, Aquatic Life Other than Fish. Class 3 waters are waters other than those designated as Class 1 that are intermittent, ephemeral, or isolated waters, and because of natural habitat conditions, do not support nor have the potential to support fish populations or spawning or certain perennial waters that lack the natural water quality to support fish (e.g., geothermal areas). Class 3 waters provide support for invertebrates, amphibians, or other flora and fauna that inhabit waters of the state at some stage of their life-cycles. Uses designated on Class 3 waters include aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value. Generally, waters suitable for this classification have wetland characteristics; and such characteristics will be a primary indicator used in identifying Class 3 waters. There are four subcategories of Class 3 waters.

(d) Class 4, Agriculture, Industry, Recreation, and Wildlife. Class 4 waters are waters other than those designated as Class 1 where it has been determined that aquatic life uses are not attainable pursuant to the provisions of Section 33 of these regulations. Uses designated on Class 4 waters include recreation, wildlife, industry, agriculture and scenic value (Wyoming DEQ No Date-b).

**Type E Fence:**

Identified as a wildlife-friendly fence type that more effectively accommodates wildlife passage than other traditional fence types. Four-wire construction allows most wildlife species to pass over or under the fence and provides adequate containment for livestock.

**Unique Forest and Woodland Communities:**

Forest and woodland habitats recognized as significant for at least one factor such as density, diversity, size, public interest, remnant character, age, or having limited distribution throughout the planning area.

**Utilization Levels:**

The proportion or degree of current year's forage production that is consumed or destroyed by animals (including insects). It may refer either to a single plant species, a group of species, or to the vegetation as a whole, generally expressed as a percentage.

**Vegetative Diversity:**

The variety of vegetative types in an area, including species, the genetic differences among species and populations, the communities and ecosystems in which vegetation types occur,

and the structure and seral stage of these communities. Vegetative diversity includes rare, as well as common vegetative types, and typically supports a diverse array of animal species and communities.

**Viewshed:**

Viewshed is used in Visual Resource Management to describe "... landscape that can be seen under favorable atmospheric conditions from a viewpoint (key observation point) or along a transportation corridor" (BLM 1984).

**Visual Resource Management Classes:**

Class I. The objective of this class is to maintain a landscape setting that appears unaltered by humans. It is applied to wilderness areas, some natural areas, wild portions of wild and scenic rivers, and other similar situations in which management activities are to be restricted.

Class II. The objective of this class is to design proposed alterations so as to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III. The objective of this class is to design proposed alterations so as to partially retain the existing character of the landscape. Contrasts to the basic elements (form, line, color, and texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape; however, the changes should remain subordinate to the existing characteristic landscape.

Class IV. The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, changes should repeat the basic elements (form, line, color, and texture) inherent in the characteristic landscape.

Rehabilitation Area. Change is needed or change may add acceptable visual variety to an area. This class applies to areas where the naturalistic character has been disturbed to a point at which rehabilitation is needed to bring it back into character with the surrounding landscape. This class would apply to areas identified in the scenic evaluation where the quality class has been reduced because of unacceptable cultural modification. The contrast is inharmonious with the characteristic landscape. It may also be applied to areas that have the potential for enhancement; i.e., add acceptable visual variety to an area or site. It should be considered an interim or short-term classification until one of the other Visual Resource Management Class objectives can be reached through rehabilitation or enhancement. The desired visual resource management class should be identified.

**Visual Resources:**

The visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

**Waiver:**

A permanent exemption of a stipulation.

**Wetlands:**

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which, under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, Riparian-Wetland Area Management, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

**Wildfire:**

An unplanned ignition of a wildland fire (such as a fire caused by lightning, volcanoes, unauthorized and accidental human-caused fires) and escaped prescribed fires.

**Wildland Fire:**

A general term describing any non-structure fire that occurs in the wildland.

**Wildland Industrial Interface:**

The area where industrial development meets or intermingles with undeveloped wildland.

**Wildland Urban Interface:**

The Healthy Forest Recreation Act 2003 defines wildland urban interface (Section 101) as an area within or adjacent to an at risk community that has been identified by a community in its wildfire protection plan or, for areas that do not have such a plan, an area extending; (1) ½ mile from the boundary of an at risk community, or; (2) 1½ miles when other criteria are met. (e.g., a sustained steep slope or a geographic feature aiding in creating an effective fire break or is condition class III land, or; (3) is adjacent to an evacuation route.

**Wildlife-disturbing Activity:**

BLM-authorized activities other than routine maintenance that may cause displacement of or excessive stress to wildlife during critical life stages. Wildlife-disturbing activities include human presence, noise, and activities using motorized vehicles or equipment.

**Wind River Indian Reservation:**

Indian reservation shared by the Eastern Shoshone and Northern Arapaho tribes of Native Americans in the central western portion of Wyoming. It is the seventh-largest Indian reservation by area in the United States, encompassing a land area of 3,473.272 square miles. It encompasses just over one-third of Fremont County and over one-fifth of Hot Springs County, and the reservation is located in the Wind River Basin, surrounded by the Wind River Mountain Range, Owl Creek Mountains, and the Absaroka Mountains.

**Withdrawal:**

Removal or withholding of public lands, by statute or Secretarial order, from operation of some or all of the public land laws. A mineral withdrawal includes public lands potentially valuable for leasable minerals, precluding the disposal of the lands except with a mineral reservation clause, unless the lands are found not to contain a valuable deposit of minerals. A mineral withdrawal is the closing of an area to mineral location and development activities.

**Yellowcake:**

Yellowcake is the product of the uranium extraction (milling) process. Early production methods resulted in a bright yellow compound, hence the name yellowcake. The material is a mixture of uranium oxides that can vary in proportion and color from yellow to orange to dark green (blackish), depending at which temperature the material was dried (level of hydration and impurities). Higher drying temperatures produce a darker, less soluble material. Yellowcake is commonly referred to as  $U_3O_8$  and is assayed as pounds  $U_3O_8$  equivalent. This fine powder is packaged in drums and sent to a conversion plant that produces uranium hexafluoride as the next step in the manufacture of nuclear fuel.



# Appendix A. Federal Laws, Regulations, Policies, Guidance, and Other Applicable Mandates and Authority

**Table A.1. Federal Laws and Statutes**

<b>Federal Law or Statute</b>	<b>Year</b>
Independent Offices Appropriation Act of 1952 (31 United States Code [U.S.C.] 9701)	1952
American Indian Religious Freedom Act (42 U.S.C. 1996)	1978
Antiquities Act (Public Law [P.L.] 59-209; 34 Stat. 225; 16 U.S.C. 431-433)	1906
Archeological Resources Protection Act (P.L. 96-95; 93 Stat. 721; 16 U.S.C. 470aa et seq.) as amended (P.L. 100-555; P.L. 100-588)	1979
Archeological and Historic Preservation Act (16 U.S.C. 469-469c-1, P.L. 86-523, 74 Stat. 220, 88 Stat. 174)	1974
Archeological and Paleontological Salvage for Federal Highway Projects (23 U.S.C. 305; 72 Stat. 913 [1958], 74 Stat. 525 [1960])	1960
Bald Eagle Protection Act (16 U.S.C. 668-668d, 54 Stat. 250)	1940
Carlson-Foley Act of 1968 (42 U.S.C. 1241-1243)	1968
Clean Air Act (42 U.S.C. 7401-7626, P.L. 159), as amended (P.L. 108-201)	1970
Coastal Zone Management Act (P.L. 92-583, 16 U.S.C. 1451-1456)	1972
Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9601)	1980
Department of the Interior Secretarial Order 3226	2001
Desert Land Act (19 Stat. 377; 43 U.S.C. 321-323), as amended	1877
Domestic Minerals Program Extension Act	1953
Economy Act 1932 (P.L. 72-211; 47 Stat. 417; 31 U.S.C. 686), as amended	1932
Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001-11050)	1986
Emergency Wetland Resources Act	1986
Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884), as amended	1973
Energy Independence and Security Act	2007
Energy Policy Act (P.L. 109-58)	2005
Executive Order 11514 – Protection and Enhancement of Environmental Quality	1970
Executive Order 11593 – Protection and Enhancement of the Cultural Environment	1971
Executive Order 11644 – Use of Off-Road Vehicles on the Public Lands	1972
Executive Order 11738 – Providing for administration of the Clean Air Act and the Federal Water Pollution Control Act with respects to federal contracts, grants, or loans	1973
Executive Order 11987 – Exotic organisms	1977
Executive Order 11988 – Floodplain Management	1977

*Appendix A Federal Laws, Regulations, Policies, Guidance, and Other Applicable Mandates and Authority*

<b>Federal Law or Statute</b>	<b>Year</b>
Executive Order 11989 – Off-Road Vehicles on Public Lands	1977
Executive Order 11990 – Protection of Wetlands	1977
Executive Order 11991 – Relating to protection and Enhancement of Environmental Quality	1977
Executive Order 12088 – Federal Compliance with Applicable Pollution Control	1978
Executive Order 12580 – Superfund Implementation and 13016 – Amendment to Executive Orders 12580	1987, 1996
Executive Order 13007 – Indian Sacred Sites	1996
Executive Order 13084 – Consultation and Coordination with Indian Tribal Governments	1998
Executive Order 13112 – Invasive Species	1999
Executive Order 13148 – Greening of the Government through Leadership in Environmental Management	2000
Executive Order 13195 – Trails for America in the 21st Century	2001
Executive Order 13212 – Actions to Expedite Energy-Related Projects	2003
Executive Order 13287 – Preserve America	2003
Executive Order Public Water Reserve 107	1926
Executive Order 10355 – Designating the Provisional Intergovernmental Committee for the movement of migrants from Europe as a public international organization entitled to enjoy certain privileges, exemptions, and immunities	1952
Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments	2000
Executive Order 6910 and Executive Order 6964, and amendments	1934
Federal Aid Highway Act (23 U.S.C. 107[d] and 317)	1958
Federal Cave Resources Protection Act (16 U.S.C. 4301-4309)	1988
Federal Coal Leasing Amendments Act (90 Stat. 1083-1092), as amended	1976
Federal Coal Management Program Coal Screening Process (43 Code of Federal Regulations [CFR] 3420.1-4)	1997
Federal Facilities Compliance Act of 1992	1992
Federal Land Policy and Management Act	1976
Federal Land Recreation Enhancement Act	2004
Federal Land Transaction Facilitation Act (43 U.S.C. 2301, et seq.)	2000
Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 et seq.)	1974
Federal Oil and Gas Royalty Management Act	1982
Federal Plant Pest Act (7 U.S.C. 150aa et seq.)	1957
Federal Property and Administrative Services Act of 1949	1949
Federal Water Pollution Control Act (33 U.S.C. 1251-1376), as amended	1948
Federal Water Projects Recreation Act 916 U.S.C 460[L][12]-460[L][21]), as amended	1965
Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661-667e), as amended	1934
Fish and Wildlife Conservation Act (16 U.S.C. 2901-2911)	1980

<b>Federal Law or Statute</b>	<b>Year</b>
Food Security Act of 1985 (16 U.S.C. 3801-3862)	1985
General Allotment Act, Section 4 (25 U.S.C. 334), as amended	1887
General Mining Law of 1872, as amended	1872
Healthy Forests Restoration Act (P.L. 108-148)	2003
Historic Sites Act of 1935 (16 U.S.C. 461 et seq.)	1935
Lacey Act (18 U.S.C. 42), as amended	1988
Land & Water Conservation Act (16 U.S.C. 4601-4), as amended	1965
Lode Law Act of 1866 (14 Statute 251)	1866
Migratory Bird Conservation Act of 1929 (16 U.S.C. 715-715r)	1929
Migratory Bird Treaty Act of 1918 (16 U.S.C. 703 et seq.)	1918
Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.)	1920
Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351 et seq.)	1947
Mining and Mineral Policy Act of 1970 (30 U.S.C. 181 et seq.)	1970
Mining Claim Rights Restoration Act (30 U.S.C. 621-625)	1955
National Environmental Policy Act	1969
National Fire Plan	2000
National Historic Trails System Act (16 U.S.C. 1241-1249), as amended	1968
National Historic Preservation Act of 1966 (16 U.S.C. 470)	1966
National Materials and Minerals Policy, Research and Development Act of 1980 (P. L. 96-479, 94 Stat. 2305)	1980
National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300)	1998
National Parks and Recreation Act of 1978 (16 U.S.C. 1242 and 1243)	1978
National Trails System Act of 1968 (16 U.S.C. 1241 et seq.), as amended	1968
National Wild & Scenic Rivers Act (16 U.S.C. 1271 et seq.)	1968
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.)	1990
Neotropical Migratory Bird Conservation Act (P.L. 106-247)	2000
Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 U.S.C. 4701 et seq.), as amended	1990
Noxious Weed Control Act of 2004 (P.L. 108-412)	2004
O&C Lands Act of 1937 (62 Stat. 162)	1948
Occupational Safety and Health Act (29 U.S.C. 651 et seq.)	1970
Oil Pollution Act (33 U.S.C. 2701 et seq.)	1990
Plant Protection Act (7 U.S.C. 7701-7772)	2000
Pollution Prevention Act (42 U.S.C. 13101)	1990
Public Range Improvement Act (43 U.S.C. 1901 et seq.)	1978
Public Rangelands Improvement Act of 1978 (43 U.S.C. 1901 et seq.)	1978
The Recreation and Public Purposes Act (43 U.S.C. 869), as amended in 1988	1926

*Appendix A Federal Laws, Regulations,  
Policies, Guidance, and Other Applicable  
Mandates and Authority*

<b>Federal Law or Statute</b>	<b>Year</b>
Reorganization Plan No. 3 of 1946 (5 U.S.C. Section 402)	1946
Reservoir Salvage Act of 1960 (16 U.S.C. 469), as amended by Archeological and Historic Preservation Act of 1974	1960
Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.), as amended, and the Bevill Amendment (Section 3001[b][3][A][ii] and 40 CFR 261.4[b][7])	1976
Riparian-Wetlands Initiative for the 1990s, U.S. Department of the Interior, Bureau of Land Management, January 22, 1992	1992
Rivers and Harbors Act of 1899 (10 U.S.C. 1899, Section 10)	1899
Safe Drinking Water Act (L. 95-190; 42 U.S.C. 201, 300 et seq.), as amended	1977
San Juan Basin Wilderness Protection Act of 1984 (16 U.S.C. § 1132)	1984
National Historic Preservation Act of 1966 (16 U.S.C. 470)	1966
Sikes Act of 1974, as amended (16 U.S.C. 670 et seq.)	1974
Soil and Water Resources Conservation Act of 1977 (16 U.S.C. 2001 et seq.)	1977
Soil Conservation and Domestic Allotment Act of 1935 (16 U.S.C. 590), as amended	1935
Soil Information Assistance for Community Planning and Resource Development Act of 1966 (42 U.S.C. 3271)	1966
Stock Raising Homestead Act of 1916 (43 U.S.C. 299), as amended	1916
Surface Mining Control and Reclamation Act (30 U.S.C. 1201 et seq.)	1977
Surface Resources Act of 1955 (30 U.S.C. 611-614)	1955
The Airport and Airway Improvement Act, Section 516 (49 U.S.C. 2215)	1982
The Department of Energy Organization Act (42 U.S.C. 7101 et seq.)	1977
The Engle Act (43 U.S.C. 155 et seq.)	1958
The Geothermal Steam Act of 1970 (30 U.S.C. 1001 et seq.), as amended	1970
The Land and Water Conservation Fund (43 U.S.C. 460 et seq.)	1965
The Mining and Minerals Policy Act of 1970	1970
The Multiple Mineral Development Act (30 U.S.C. 521-531 et seq.)	1954
The Wilderness Act of 1964 (16 U.S.C. 1131), as amended	1964
Toxic Substance and Control Act of 1976 (P.L. 104-66), as amended in 1995	1976
Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management	2000
U.S. Onshore Orders Onshore Order No. 1 – Approval of Operations on Onshore Federal and Indian Oil and Gas Leases	1983

<b>Federal Law or Statute</b>	<b>Year</b>
Onshore Order No. 2 – Onshore Oil and Gas Drilling Operations on Federal and Indian Oil and Gas Leases	1988
Onshore Order No. 3 – Site Security on Federal Oil and Gas Leases	1989
Onshore Order No. 4 – Measurement of Oil on Federal Oil and Gas Leases	1989
Onshore Order No. 5 – Measurement of Gas on Federal Oil and Gas Leases	1989
Onshore Order No. 6 – Hydrogen Sulfide Operations on Federal Oil and Gas Leases	1991
Onshore Order No. 7 – Disposal of Produced Water from Federal Oil and Gas Leases	1993
Water Quality Act of 1987, as amended from the Federal Water Pollution Control Act of 1977 (Clean Water Act) (33 U.S.C. 1251 et seq.), as amended	1987
Water Resources Development Act	1974
Water Resources Planning Act (42 U.S.C. 1962a-1962[a][4][e]), as amended	1965
Watershed Protection and Flood Protection Act (16 U.S.C. 1001 et seq.), as amended	1954
Watershed Restoration and Enhancement Agreements (“Wyden Amendment”) (P.L.-104-208, Sec. 124, P.L. 10-5-277, Sec. 136 of the 1999 Interior Appropriations Act of 1998)	1998
Wild and Free Roaming Horse and Burro Act (P.L. 92-195)	1971
Wild and Scenic Rivers Act (16 USC 1271 et seq.)	1968
Federal Wildland Fire Management Policy	2001
U.S. V. Peck, No. 97-8122, 1999 WL 33022	1999
Placer Law – Act of July 9, 1870 (16 Stat. 217)	1870
Carey Act of August 18, 1894 (43 U.S.C. 641 et seq.), as amended	1894
Earl Douglass, 44 L.D. 325, August 6, 1915	1915
Act of April 23, 1932; 47 Stat. 136	1932
The Act of June 28, 1934; Section 7 (43 U.S.C. 315f), as amended	1934
The Materials Act of July 31, 1947 (30 U.S.C. 601-604), as amended	1947
Acquired Lands Act – Act of August 7, 1947; 61 Stat. 913	1947
Act of September 1, 1949, Section 3 (30 U.S.C. 192c)	1949
Act of June 30, 1950 (16 U.S.C. 508[C] and [e])	1950
Act of August 13, 1954 (68 Stat. 708, 30 U.S.C. 521 subpart)	1954
Multiple Mineral Development Act of August 13, 1954 (30 U.S.C. 521-531 et seq.)	1954
Act of July 23, 1955 (P.L. 167; 43 CFR 3710)	1955
Act of September 28, 1962 (P.L. 87-713, 76 Stat. 652)	1962
Classification and Multiple Use Act of September 19, 1964 (78 Stat. 986, 43 U.S.C. 1411-18)	1964
Act of October 30, 1978 (92 Stat. 2073-2075)	1978
Naval Petroleum Reserves Production Act (43 CFR 2361.1[f])	1976

**Table A.2. Bureau of Land Management Regulations and Policies**

<b>BLM Directive</b>	<b>Year</b>
Abandoned Mine Lands National Strategic Plan	2006
Applications for Permit to Drill Fees	2007
Applications for Permits to Drill	2007
Best Management Practices – “The Gold Book”	2007
BLM 3809 Manual (1985, revised 2001)	2001
BLM Handbook (Draft) H-2101-5 – Environmental Site Assessments for Disposal of Real Property	2004
BLM Handbook 2200-1, Land Exchange Handbook	2005
BLM Handbook 3809 (Draft 2006)	2006
BLM Handbook H-1112-2, Safety and Health for Field Operations Manual	1998
BLM Handbook H-1703-1, Response Actions NCP/Comprehensive Environmental Response, Compensation, and Liability Act	2001
BLM Handbook H-1742-1, Burned Area Emergency Stabilization and Rehabilitation Handbook	2007
BLM Handbook H-1790-1, National Environmental Policy Act	2008
BLM Handbook H-2101-4, Pre-Acquisition Environmental Site Assessments	2000
BLM Handbook H-3042-1, Solid Minerals Reclamation Handbook	1992
BLM Handbook H-3720-1, Abandoned Mine Land Program Policy	2007
BLM Handbook H-3809-1, for Mineral Examiners, v. 3-332, Sept. 11, 2007	2007
BLM Handbook H-3809-3, Validity Mineral Reports, June 1969	1969
BLM Handbook H-4180-1, Rangeland Health Standards	2001
BLM Handbook H-8160-1, General Procedural Guidance for Native American Consultation	1994
BLM Handbook H-8550-1, Interim Management Policy for Lands Under Wilderness Review	1987
BLM Handbook H-9214-1, Prescribed Fire Management Handbook	1998
BLM Information Bulletin No. WO-2002-101, Cultural Resource Considerations in Resource Management Plans	2002
BLM Instruction Memorandum No. 2008-009, Potential Fossil Yield Classification System for Paleontological Resources on Public Lands	2007
BLM Instruction Memorandum No. WO-2003-147, Application for Permit to Drill – Process Improvement #3 – Cultural Resources	2003
BLM Instruction Memorandum No. WO-2005-003, Cultural Resources and Tribal Consultation for Fluid Minerals Leasing	2005
BLM Instruction Memorandum No. WO-2005-227, National Historic Preservation Act Section 106 and Oil and Gas Permitting	2005
BLM Instruction Memorandum No. WO-99-039, Issuance of Grazing Permits in Compliance with Applicable Laws, Regulations and Policy	1999

<b>BLM Directive</b>	<b>Year</b>
BLM Instruction Memorandum No. WY-97-111, Report of Conformance of BLM Land Use Plans with the Standards & Guidelines on the Public Lands; Follow-up Maintenance of Land Use Plans	1997
BLM Instruction Memorandum No. WY-99-20, Complying with Section 106 in Conformance with WOIM No. 99-039	1999
BLM Instruction Memorandum No. WO-2003-147, Application for Permit to Drill – Process Improvement #3 – Cultural Resources	2003
BLM Instruction Memorandum No. WO-2005-003, Cultural Resources and Tribal Consultation for Fluid Minerals Leasing	2005
BLM Instruction Memorandum No. WO-2005-227, National Historic Policy Act Section 106 and Oil and Gas Permitting	2005
BLM Instruction Memorandum No. WO-99-039, Issuance of Grazing Permits in Compliance with Applicable Laws, Regulations and Policy	1999
BLM Instruction Memorandum No. WY-2005-046, Conservation Measures and Best Management Practices for the Management of Potential Gray Wolf Habitat	2005
BLM Instruction Memorandum No. WY-2005-058, Conservation Measures and Best Management Practices for the Management of Potential Canada Lynx Habitat	2005
BLM Instruction Memorandum No. WY-2006-037, Conservation Measures and Best Management Practices for the Management of Potential Black-footed Ferret Habitat	2006
BLM Instruction Memorandum No. WY-2006-049, Conservation Measures and Best Management Practices for the Management of Grizzly Bear Habitat	2006
BLM Instruction Memorandum No. WY-2006-197, BLM Energy and Non-Energy Mineral Policy	2006
BLM Instruction Memorandum No. WY-2007-018, Conservation Measures and Best Management Practices for the Management of Mountain Plover Habitat	2007
BLM Instruction Memorandum No. 2007-097, Solar Energy Development Policy	2007
BLM Instruction Memorandum No. 2009-011, Assessment and Mitigation of Potential Impacts to Paleontological Resources	2008
BLM Instruction Memorandum No. 2009-043, Guidance for Wind-energy Development on BLM Land	2009
BLM Instruction Memorandum No. 2009-113, Casual Collecting of Common Invertebrate and Plant Paleontological Resources under the Paleontological Resources Preservation Act of 2009	2009
BLM Instruction Memorandum No. 2009-138, Confidentiality of Paleontological Locality Information under the Omnibus Public Lands Act of 2009	2009
BLM Instruction Memorandum No. 2009-215, Planning for Special Designations within the National System of Public Lands.	2009
BLM Instruction Memorandum No. 2011-003, Solar Energy Development Policy	2010

*Appendix A Federal Laws, Regulations, Policies, Guidance, and Other Applicable Mandates and Authority*

<b>BLM Directive</b>	<b>Year</b>
BLM Land Use Planning Handbook H-1601-1	2005
BLM Manual 1737, Riparian Habitat	1992
BLM Manual 2800, Cadastral Surveys-General	1985
BLM Manual 3060, Mineral Reports – Preparation and Review, April 7, 1994	1994
BLM Manual 4180, Land Health	2001
BLM Manual 6500, Manual of Wildlife, Fish and Plant Resources	2002
BLM Manual 6840, Special Status Species Management	1988
BLM Manual 6840, Special Status Species Policy	2008
BLM Manual 8100, Cultural Resource Management	2004
BLM Manual 8110, Identifying Cultural Resources	2004
BLM Manual 8120, Tribal Consultation Under Cultural Resources	2004
BLM Manual 8130, Planning for Uses of Cultural Resources	2004
BLM Manual 8160, Native American Consultation and Coordination	1990
BLM Manual 8270, Paleontological Resource Management	1998
BLM Manual 8340, Off-Road Vehicles	1982
BLM Manual 8341, Conditions of Use (Off- Road Vehicles)	1979
BLM Manual 8342, Designation of Roads and Trails	1988
BLM Manual 8343, Vehicle Operations	1979
BLM Manual 8344, Permits	1979
BLM Manual 8351, Wild and Scenic Rivers	1992
BLM Manual 8400, Visual Resource Management	1980
BLM Manual Section 1703, Hazardous Materials Management	2007
BLM Manual Section 7240, Water Quality	1978
BLM Manual Section 7250, Water Rights	1984
BLM Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management	1998
BLM Policy Statement on Riparian Area Management	1987
BLM TR 1734-6 Version 4: Interpreting Indicators of Rangeland Health	2005
BLM TR 1737 series: Riparian Area Management Assessing Proper Functioning Condition for Lotic and Lentic Areas	1998
BLM Wyoming Riparian Management Activity Guide	1991
BLM Wyoming Sensitive Species Policy and List	2002
Board of Regents of the University of Oklahoma, 165 IBLA 231	2005
BLM Grazing Administration Range Improvements and Water Rights (43 CFR 4100 et seq.)	2002 (revised)
Cave Management (43 CFR 37.4[c] and 37.11[c][3][iii])	1988
Competitive Leasing (43 CFR 3120)	2002
Delegation of Authority, Cooperative Agreements & Contracts for Oil & Gas Inspection (43 CFR 3190)	1987
Federal Coal Management Program Regulations (43 CFR Group 3400)	1979
Federal Manual for Identifying and Delineating Jurisdictional Wetlands	1991



<b>BLM Directive</b>	<b>Year</b>
Fish and Wildlife 2000 BLM National, State and District policies	2000
Geothermal Resource Leasing (43 CFR 3200)	1998
Geothermal Resources Unit Agreements (43 CFR 3280)	1973
Instruction Memorandum 2002-196	2002
Instruction Memorandum 2003-020, Interim Wind Energy Development Policy	2003
Instruction Memorandum 2005-069, Offsite Compensatory Mitigation Guidelines	2005
Instruction Memorandum 2005-176, Filing of Protests on lands Included in Oil and Gas Lease Sales	2005
Instruction Memorandum 2005-210, Energy Policy and Conservation Act Inventory – Data Compilation for Phases III and IV	2005
Instruction Memorandum 2005-247, National Environmental Policy Act Compliance for Oil, Gas, and Geothermal Development	2005
Instruction Memorandum 2006-071, Process Improvement for Oil, Gas, Geothermal, Geophysical, and Related Rights-of-Way Approvals	2006
Instruction Memorandum 2006-197, BLM Energy and Non-Energy Mineral Policy	2006
Instruction Memorandum 2006-206, Oil and Gas Bond Adequacy Reviews	2006
Instruction Memorandum 2006-145, Cooperative Conservation Based Strategic Plan for the Abandoned Mine Lands Program	2006
Instruction Memorandum 2007-096, Refinement of the Methodology to Identify Abandoned Mine Land Sites Near Populated Places and High Use Areas	2007
BLM Instruction Memorandum 2009-011, Assessment and Mitigation of Potential Impacts to Paleontological Resources	2008
Instruction Memorandum No. WY-2003-011	2002
Instruction Memorandum No. WY-2006-009	2006
Mineral Leasing Act of 1920 (43 CFR From 3100-11 [July 2006], 43 CFR Part 3160)	1920
Mineral Leasing Act of 1920 (43 CFR 2006 3425.1–7[a][2][iv, v])	1920
Mineral Leasing Act of 1920 (43 CFR 2006 3461.5[h][2][i])	1920
Mineral Leasing Act of 1920 and others (43 CFR 2006 3591.1[b][10])	1920
Mineral Leasing Act of 1920 and others (43 CFR 2006 3430.4-4[a][10]; 43 CFR 2006 3430.4-4[b][8])	1920
Minerals Management, Generally (43 CFR 3000)	1983
National Contingency Plan Regulations (40 CFR 300)	1994
National Management Strategy for Motorized Off-Highway Vehicle Use on BLM Public Lands	2001
National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties	1990
National Register of Historic Places Eligibility (36 CFR Part 60.4)	1966
Natural Resource Damage Assessment Regulations (43 CFR Part 11)	1986

<b>BLM Directive</b>	<b>Year</b>
Noncompetitive Leasing (43 CFR 3110)	1988
Off-Road Vehicle Implementation Strategy Washakie Resource Area	1994
Oil and Gas Leasing (43 CFR 3100)	1983
Onshore Oil and Gas Geophysical Exploration (43 CFR 3150)	1988
Onshore Oil and Gas Operations (43 CFR 3160)	1982
Onshore Oil and Gas Unit Agreements; Unproven Areas (43 CFR 3180)	1983
Permits for Recreation on Public Lands (43 CFR 2930)	2004
Riparian-Wetlands Initiative for the 1990s, the U.S. Department of the Interior, Bureau of Land Management	1992
Solicitor's Opinion of January 17, 1986	1986
Solicitor's Opinion of July 10, 1963	1963
Solicitor's Opinion of October 12, 1956	1956
Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming	2004
Standards for Healthy Rangelands, Standard #2	1997
The Standards for Healthy Rangelands and Guidance for Livestock Grazing Management (43 CFR 4180)	1997
WO – Instruction Memorandum – 2002-034, Recent Changes in Management Direction: Federal Wildland Fire Management Policy, National Fire Plan	2002
WY Instruction Memorandum No. 2005-034, Travel Management Guidelines for the Public Lands in Wyoming	2005
WY Instruction Memorandum No. 89-402, April 3, 1989, Inspection and Enforcement Program for Locatable Minerals Activities	1989
WY-2001-040, Issuance of BLM (Wyoming) Sensitive Species Policy and List (Expires 9/30/02)	2001
Wyoming BLM Coal/Coal Bed Methane Policy	2000
Wyoming BLM Soil Program Ten Year Strategy	2003
Wyoming Instructional Memorandum 87-672, August 26, 1987	1987

**Table A.3. Applicable Wyoming State Laws and Regulations**

<b>Wyoming State Laws and Regulations</b>
Wyoming State Engineer's Office Statutes, Rules and Regulations
State of Wyoming Occupational Health and Safety Rules and Regulations
State of Wyoming Oil & Gas Conservation Commission Rules and Regulations
Wyoming Department of Environmental Quality Rules and Regulations
State of Wyoming Occupational Health and Safety Rules and Regulations
State of Wyoming Oil & Gas Conservation Commission Rules and Regulations
Wyoming Department of Environmental Quality Rules and Regulations
Wyoming Environmental Quality Act
State of Wyoming Water Quality Rules and Regulations
Wyoming Executive Department, Office of the Governor, Executive Order 2008-2. Greater Sage-grouse Core Area of Protection

**Table A.4. Memoranda and Agreements**

<b>Memoranda and Agreements</b>	<b>Year</b>	<b>Description</b>
Association of Fish and Wildlife Agencies, U.S. Forest Service (USFS), BLM, Fish and Wildlife Service	2006	Policies and guidelines for fish and wildlife management in National Forest and BLM Wilderness.
Yellowstone River Compact	1950	Between the states of Wyoming, Montana, and North Dakota was agreed upon to create an equitable division and apportionment of such waters; this compact ultimately controls the future and current uses of surface water resources in the basin. Ongoing litigation between Wyoming and Montana over the inclusion of groundwater in this compact is yet to be resolved.
Memorandum of Understanding No. WY 19	2003	Between the U.S. Department of the Interior (DOI), BLM, and the Wyoming Department of Environmental Quality (DEQ)-Land Quality Division (LQD) and addresses Management Of Surface Mining and Exploration for Locatable Minerals on Public Lands. It was signed November 11, 2003. This is a Supplemental Memorandum to the General Statewide Memorandum of Understanding (Memorandum of Understanding) dated October 1975, between the Governor of Wyoming and the United States, by and through the State Director, BLM, DOI.
Wyoming DEQ	N/A	There are currently no agreements between BLM and the State of Wyoming DEQ-LQD regarding exploration for or development of non-energy leasable minerals. Wyoming DEQ-LQD processes applications for these minerals under their "Non-Coal" rules and regulations. It is possible that the same Memorandum of Understanding between BLM and Wyoming DEQ-LQD for locatable minerals would have some valuable application should these two agencies need to work together to process applications related to non-energy leasable minerals.
Clean and Diversified Energy Initiative	2005	Recommends initiatives to facilitate the timely leasing and permitting of geothermal resources.
BLM Memorandum of Understanding WO300-2006-08, April 2006	2006	Facilitate interagency coordination and establish policies and procedures to implement Section 225 of the Energy Policy Act of 2005.

Memoranda and Agreements	Year	Description
National Memorandum of Understanding between the BLM and the Department of Defense	—	This Memorandum of Understanding outlines procedures for processing Notice of Intent (NOI)s to conduct geophysical operations when Air Force, Army, and Navy lands are involved. The Department of Defense will be the lead agency when their lands are involved in an NOI.
Interagency between BLM and Bureau of Reclamation Agreement	—	The BLM has jurisdiction over NOIs to conduct geophysical exploration which involve Bureau of Reclamation Agreement lands. The Bureau of Reclamation Agreement will be contacted for their conditions of approval.
Memorandum of Understanding between BLM and State of Wyoming Oil and Gas Conservation Commission	—	Outlines the handling of NOIs to conduct geophysical exploration and sharing of information and compliance inspections. The State of Wyoming Oil and Gas Conservation Commission has jurisdiction over injection wells and spacing.
Memorandum of Agreement, between the Wyoming DEQ and the State of Wyoming Oil and Gas Conservation Commission	1999	Wyoming DEQ delegated permitting of road applications for oilfield wastes when the wastes are to be applied on the lease, unit, or communitized area. Wyoming DEQ still has the jurisdiction for permitting road application of oil field wastes outside of the lease, unit, or communitized area.
Interagency Agreement between the USFS and the BLM	2006	Establishes procedures for the administration of oil and gas operations on federal leases within the National Forest System.
Memorandum of Understanding BLM/Animal and Plant Health Inspection Service-Wildlife Services	2003	Detailing cooperative efforts between the two groups on suppression of grasshoppers and Mormon crickets on BLM lands (Document #03-8100-0870-MU, February 27, 2003) and local Natural Resources Conservation Service.
Western Association of Fish and Wildlife Agencies /USFS/BLM/USFWS Memorandum of Understanding (08-31-2000)	2000	Involving the management of sage grouse and their habitat.
Memorandum of Understanding between the BLM and the Department of Agriculture (60F26045-48)	1995	Predator control protocols were formalized in this Interagency Memorandum of Understanding.
Cooperative Agreements with Weed and Pest Districts: Bighorn County, Hot Springs County, Park County, Washakie County	—	Details cooperative efforts for noxious weed control on BLM-administered lands by the county weed and pest districts.

<b>Memoranda and Agreements</b>	<b>Year</b>	<b>Description</b>
Programmatic Agreement Among BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Offices (SHPO)	1997	Regarding the manner in which BLM will meet its responsibilities under the National Historic Preservation Act.
State Protocol Agreement Between the Wyoming BLM State Director and the Wyoming SHPO	2006	Regarding the manner in which the BLM will coordinate with the Wyoming SHPO.
Memorandum of Agreement WY-7	—	Memorandum of Agreement between the BLM and the Wyoming Recreation Commission; addresses land classifications and withdrawals to protect public lands generally, and specifically to protect historic trails.
Memorandum of Agreement WY-19	—	Memorandum of Agreement between the BLM and the Wyoming Governor, addresses overall cooperation in public and state land management efforts.
Memorandum of Agreement WY-20	—	Memorandum of Agreement between the BLM and the Wyoming Game and Fish Commission, addresses a myriad of land and resource management issues, including classifications, land acquisition and disposal, and access.
Memorandum of Agreement WY-21	—	Memorandum of Agreement between the BLM and Region II and Region IV of the USFS, addresses overall coordination on a myriad of land and resource management issues.
Memorandum of Agreement WY-63	—	Memorandum of Agreement among the BLM, the USFS, Wyoming Department of Public Lands and the Wyoming Game and Fish Commission, addresses public land access and management of access problems.
Memorandum of Agreement WY-65	—	Memorandum of Agreement between the BLM and the Agricultural Stabilization and Conservation Service (ASCS), addresses overall coordination on a myriad of land and resource management issues.
Memorandum of Agreement WY-77	—	Memorandum of Agreement among the BLM, the ASCS, USFS, AES, and Wyoming State Conservation Commission, addresses overall coordination on conservation planning projects.
Memorandum of Agreement WY-117	—	Memorandum of Agreement among the BLM and the Wyoming Board of Land Commissioners, the Wyoming SHPO and the Advisory Council on Historic Preservation, addresses cultural resource protection in state exchanges.

Memoranda and Agreements	Year	Description
Memorandum of Agreement WY-118	—	Memorandum of Agreement between the BLM and the Wyoming Board of Land Commissioners, addresses processing state exchanges.
Memorandum of Agreement WY-119	—	Memorandum of Agreement between the BLM and the ASCS, addresses management of agricultural trespass.
Memorandum of Agreement WY-121	—	Memorandum of Agreement between the BLM and the National Park Service, addresses management of the Oregon National Historic Trails.
Memorandum of Agreement WY-122	—	Memorandum of Agreement among the BLM and the USFS, Wyoming Department of Public Lands, Wyoming Game and Fish Commission, Wyoming Recreation Commission, Wyoming Department of Agriculture, and the Wyoming State Planning Coordinator's Office, addresses access to public land.
Memorandum of Agreement WY-131	—	Memorandum of Agreement between the BLM and the Wyoming Game and Fish Department (WGFD), addresses overall coordination on land and resource management.
Memorandum of Agreement WY930-91-06-38	—	Memorandum of Agreement between the BLM and the Wyoming Board of Land Commissioners, addresses exchange pooling.
Memorandum of Agreement WY930-91-06-39	—	Memorandum of Agreement between the BLM and the Wyoming Board of Land Commissioners, addresses exchange of state land in holdings in wilderness areas.
Memorandum of Understanding WY920-08-07-192	2007	Memorandum of Understanding WY920-08-07-192 between BLM, the Federal Highway Administration (FHWA), and the Wyoming Department of Transportation, addresses each agency's responsibilities in regard to processing Federal-aid highway appropriations. To implement Sections 107(d) and 317 of the Federal Aid Highway Act (23 U.S.C. 107[d] and 317), as amended, the agencies operate under this Memorandum of Understanding (updated in August 2007). All appropriations under the Federal Aid Highway Act are required to be consistent with the referenced Memorandum of Understanding.

Memoranda and Agreements	Year	Description
Memorandum of Understanding WY920-02-09-108	2002	Between the BLM, the FHWA, and the Wyoming Department of Transportation that defines each agency's responsibilities in regard to processing federal-aid highway appropriations.
Grass Creek Travel Management Area	—	BLM, Wyoming State Board of Land Commissioners, WGFD, LU Sheep Company, Travel Management in Grass Creek area.
Renner, Carter Billy Miles Tensleep Public Access Area	—	BLM, WGFD – Public access.
Medicine Lodge Habitat Management Unit Areas	—	BLM, WGFD – Public Access.
Double H Ranch Access Area	—	BLM, Double H Ranch, WG&F – Public Access.
Nowater OHV Trail System	—	BLM, Wyoming State Trails Program, Worland Chamber of Commerce, Ten Sleep Chamber of Commerce.
Cooperative Management Agreement between BLM, Worland District, LU Sheep Company, WGFD, Wyoming State Board of Land Commissioners	1989	
Public Access Area Agreements Between BLM and WGFD	—	Public access area agreements to numerous BLM parcels on South Fork, Shoshone, North Fork Shoshone, Clarks Fork of the Yellowstone River, and Luce and Hogan Reservoirs.
Cooperative Management Agreement between BLM, Worland District, WGFD, Wyoming State Board of Land Commissioners, Double-H Ranch	June 1994	
Assistance agreement KAA990028 – Abandoned Mine Land Reclamation Agreement	—	The Abandoned Mine Land program in Wyoming currently operates pursuant to this assistance agreement between the Wyoming State Office of the BLM and the Wyoming DEQ. It provides for the cooperative effort between the two agencies for a long term relationship to efficiently and economically plan for, and share responsibilities of, effective abandoned mine land reclamation on public lands in Wyoming.
March 1990, an Umbrella Memorandum of Understanding between the WGFD and BLM Wyoming for Management of the Fish and Wildlife Resources on the Public Lands was signed (No Number)	1990	The purpose of the Memorandum of Understanding is to strengthen the cooperative approach to the management of wildlife and wildlife habitat on public land between the two agencies and to encourage them to work together to develop, enhance, maintain, and manage wildlife resources, including planning and sharing data concerning biological resources.

Memoranda and Agreements	Year	Description
The Paleontological Resources Preservation Act	2009	Recently signed legislation supplements existing laws and guidance regarding paleontological resources on BLM lands (e.g., Federal Land Policy and Management Act, BLM Manual 8270, and BLM Handbook H-8270-1). The Paleontological Resources Preservation Act became law on March 30, 2009, as part of the Omnibus Public Lands Management Act of 2009 (Public Law 111-011). The BLM has followed up with Instruction Memoranda that reinforce policies regarding confidentiality and casual collecting in light of the new law (Instruction Memorandum dated April 24, 2009, "Casual Collecting of Common Invertebrate and Plant Paleontological Resources under the Paleontological Resources Preservation Act of 2009" and Instruction Memorandum dated June 5, 2009, "Confidentiality of Paleontological Locality Information under the Omnibus Public Lands Act of 2009").
Omnibus Public Lands Management Act	2009	Recently signed legislation supplements existing laws and guidance regarding paleontological resources on BLM lands (e.g., Federal Land Policy and Management Act, BLM Manual 8270, and BLM Handbook H-8270-1). The Paleontological Resources Preservation Act became law on March 30, 2009, as part of the Omnibus Public Lands Management Act of 2009 (Public Law 111-011). The BLM has followed up with Instruction Memoranda that reinforce policies regarding confidentiality and casual collecting in light of the new law (Instruction Memorandum dated April 24, 2009, "Casual Collecting of Common Invertebrate and Plant Paleontological Resources under the Paleontological Resources Preservation Act of 2009" and Instruction Memorandum dated June 5, 2009, "Confidentiality of Paleontological Locality Information under the Omnibus Public Lands Act of 2009").
The Taylor Grazing Act	1934	The principle legislation used to administer livestock grazing on public lands until 1976 when



Memoranda and Agreements	Year	Description
		Congress passed the Federal Land Policy and Management Act.

## Appendix B. Maps

Maps are included in electronic format. In hardcopy documents, maps can be found on a compact disk (CD) attached to the inside back cover of Volume 3.

**Map 1. Surface Ownership in the Planning Area**

**Map 2. Federal Mineral Estate in the Planning Area**

**Map 3. Dubois Area**

**Map 4. Physical Resources - Major River Basins**

**Map 5. Physical Resources - Riparian Areas**

**Map 6. Physical Resources - Class I Waters**

**Map 7. Physical Resources - Wind Erosion Potential**

**Map 8. Physical Resources - Water Erosion Potential**

**Map 9. Physical Resources - Annual Precipitation**

**Map 10. Physical Resources - Surface Slope**

**Map 11. Physical Resources - Soils with Low Reclamation Potential**

**Map 12. Physical Resources - Citizen Proposed Wilderness**

**Map 13. Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative B)**

**Map 14. Physical Resources - Non-WSA Lands with Wilderness Characteristics (Alternative D)**

**Map 15. Mineral Resources - Uranium Mining Projects and Districts**

**Map 16. Mineral Resources - Geothermal Development Potential**

**Map 17. Mineral Resources - Conventional Oil and Gas Development Potential**

**Map 18. Mineral Resources - Salable Mineral Materials Sand and Gravel Occurrence Potential**

**Map 19. Mineral Resources - Phosphate Leasing Potential**

**Map 20. Mineral Resources - Coalbed Natural Gas Development Potential**

**Map 21. Mineral Resources - Locatable Mineral Withdrawals (Alternative A)**

**Map 22. Mineral Resources - Locatable Mineral Withdrawals (Alternative B)**

**Map 23. Mineral Resources - Locatable Mineral Withdrawals (Alternative C)**

**Map 24. Mineral Resources - Locatable Mineral Withdrawals (Alternative D)**

**Map 25. Mineral Resources - Geothermal Energy Constraints (Alternative A)**

**Map 26. Mineral Resources - Geothermal Energy Constraints (Alternative B)**

**Map 27. Mineral Resources - Geothermal Energy Constraints (Alternative C)**

**Map 28. Mineral Resources - Geothermal Energy Constraints (Alternative D)**

**Map 29. Mineral Resources - Oil and Gas Constraints (Alternative A)**

- Map 30. Mineral Resources - Oil and Gas Constraints (Alternative B)**
- Map 31. Mineral Resources - Oil and Gas Constraints (Alternative C)**
- Map 32. Mineral Resources - Oil and Gas Constraints (Alternative D)**
- Map 33. Mineral Resources - Oil and Gas Fields and Leases**
- Map 34. Mineral Resources - Salable - Mineral Materials Disposals (Alternative A)**
- Map 35. Mineral Resources - Salable - Mineral Materials Disposals (Alternative B)**
- Map 36. Mineral Resources - Salable - Mineral Materials Disposals (Alternative C)**
- Map 37. Mineral Resources - Salable - Mineral Materials Disposals (Alternative D)**
- Map 38. Mineral Resources - Phosphate Leasing (Alternative A)**
- Map 39. Mineral Resources - Phosphate Leasing (Alternative B)**
- Map 40. Mineral Resources - Phosphate Leasing (Alternative C)**
- Map 41. Mineral Resources - Phosphate Leasing (Alternative D)**
- Map 42. Fire Management - Fire Regime Condition Classifications**
- Map 43. Fire Management - Fire Management Units**
- Map 44. Biological Resources - Precipitation Zones for U.S. Department of Agriculture National Resources Conservation Service Ecological Site Descriptions**
- Map 45. Biological Resources - Vegetation Communities and Major Land Resource Areas**
- Map 46. Biological Resources - Invasive Plant Species**
- Map 47. Biological Resources - Primary Forest Resource Management Areas**
- Map 48. Biological Resources - Proper Functional Condition Streams**
- Map 49. Biological Resources - Fish-bearing Streams**
- Map 50. Biological Resources - Bighorn Sheep Crucial Winter Range and Parturition Areas**
- Map 51. Biological Resources - Elk Winter Ranges and Parturition Areas**
- Map 52. Biological Resources - Moose Crucial Winter Range**
- Map 53. Biological Resources - Mule Deer Crucial Winter Range**
- Map 54. Biological Resources - Pronghorn Crucial Winter Range**
- Map 55. Biological Resources - Wyoming Game and Fish Department Bighorn Sheep Herd Units**
- Map 56. Biological Resources - Wyoming Game and Fish Department Elk Herd Units**
- Map 57. Biological Resources - Wyoming Game and Fish Department Moose Herd Units**
- Map 58. Biological Resources - Wyoming Game and Fish Department Mule Deer Herd Units**
- Map 59. Biological Resources - Wyoming Game and Fish Department Pronghorn Herd Units**
- Map 60. Biological Resources - Big Game Migration Routes and Barriers**

**Map 61. Biological Resources - Wyoming Game and Fish Department White-tailed Deer Herd Units**

**Map 62. Biological Resources - Known Raptor Nests**

**Map 63. Biological Resources - Special Status Species Greater Sage-Grouse (Alternatives A and C)**

**Map 64. Biological Resources - Special Status Species Greater Sage-Grouse (Alternative B)**

**Map 65. Biological Resources - Special Status Species Greater Sage-Grouse (Alternative D)**

**Map 66. Biological Resources - Special Status Species Lynx Analysis Units**

**Map 67. Biological Resources - Special Status Species Desert Yellowhead Critical Habitat**

**Map 68. Biological Resources - Wild Horse Herd Management Areas**

**Map 69. Heritage and Visual Resources - Cultural Resources**

**Map 70. Heritage and Visual Resources - Potential Fossil Yield Classifications**

**Map 71. Heritage and Visual Resources - Visual Resource Inventory Distance Mapping Zones**

**Map 72. Heritage and Visual Resources - Visual Resource Inventory Sensitivity**

**Map 73. Heritage and Visual Resources - Visual Resource Inventory Scenic Quality**

**Map 74. Heritage and Visual Resources - New (2009) Visual Resource Inventory Classes**

**Map 75. Heritage and Visual Resources - Existing (1985) Visual Resource Management Classes (Alternative A)**

**Map 76. Heritage and Visual Resources - Visual Resource Management Classes (Alternative B)**

**Map 77. Heritage and Visual Resources - Visual Resource Management Classes (Alternative C)**

**Map 78. Heritage and Visual Resources - Visual Resource Management Classes (Alternative D)**

**Map 79. Heritage and Visual Resources - Regional Historic Trails and Early Highways (Alternatives A, C, and D)**

**Map 80. Heritage and Visual Resources - Regional Historic Trails and Early Highways (Alternative B)**

**Map 81. Land Resources - Roads in the Planning Area**

**Map 82. Land Resources - Jeffrey City Area Roads**

**Map 83. Land Resources - Lander Area Roads**

**Map 84. Land Resources - Lysite Area Roads**

**Map 85. Land Resources - Dubois Area Roads**

**Map 86. Land Resources - 1987 Recreation Opportunity Spectrum**

**Map 87. Land Resources - Recreation Opportunity Spectrum 2009 Physical Setting**

**Map 88. Land Resources - Recreation Opportunity Spectrum 2009 Social Setting**

**Map 89. Land Resources - Recreation Opportunity Spectrum 2009 Operational Setting**

**Map 90. Land Resources - Recreation Management Areas (Alternative A)**

**Map 91. Land Resources - Recreation Management Areas (Alternative B)**

**Map 92. Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative C)**

**Map 93. Land Resources - Recreation Management Areas and Recreation and Public Purpose Act Leases (Alternative D)**

**Map 94. Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternative A)**

**Map 95. Land Resources - Lands Identified for Disposal, Retention, or Acquisition (Alternatives B, C, and D)**

**Map 96. Land Resources - Wind Energy Potential**

**Map 97. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative A)**

**Map 98. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative B)**

**Map 99. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative C)**

**Map 100. Land Resources - Wind Energy Development Avoidance and Exclusion Areas (Alternative D)**

**Map 101. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative A)**

**Map 102. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative B)**

**Map 103. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative C)**

**Map 104. Land Resources - Rights-of-Way Avoidance and Exclusion Areas (Alternative D)**

**Map 105. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative A)**

**Map 106. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative B)**

**Map 107. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative C)**

**Map 108. Land Resources - Rights-of-Way Designated Corridors and Communication Sites (Alternative D)**

**Map 109. Land Resources - Trails and Travel Management (Alternative A)**

**Map 110. Land Resources - Trails and Travel Management (Alternative B)**

**Map 111. Land Resources - Trails and Travel Management (Alternative C)**

**Map 112. Land Resources - Trails and Travel Management (Alternative D)**

**Map 113. Land Resources - Trails and Travel Management Seasonal Limitation to All Travel (Human Presence) (Alternative D)**

**Map 114. Land Resources - Trails and Travel Management Over-Snow Travel (Alternative A)**

- Map 115. Land Resources - Trails and Travel Management Over-Snow Travel (Alternative B)**
- Map 116. Land Resources - Trails and Travel Management Over-Snow Travel (Alternative D)**
- Map 117. Land Resources - Livestock Grazing (Alternatives A and C)**
- Map 118. Land Resources - Livestock Grazing (Alternative B)**
- Map 119. Land Resources - Livestock Grazing (Alternative D)**
- Map 120. Land Resources - Recreation Sites**
- Map 121. Special Designations - Continental Divide National Scenic Trail**
- Map 122. Special Designations - National Historic Trails Condition Class Ratings**
- Map 123. Special Designations - National Historic Trails with Associated Sites**
- Map 124. Special Designations - National Historic Trails (Alternative A)**
- Map 125. Special Designations - National Historic Trails (Alternative B)**
- Map 126. Special Designations - National Historic Trails (Alternative C)**
- Map 127. Special Designations - Heritage Tourism and Recreation Corridor (Alternative D)**
- Map 128. Special Designations - Wilderness Study Areas**
- Map 129. Special Designations - Suitable Wild and Scenic River Segments (Alternatives A, B, and D)**
- Map 130. Special Designations - Areas of Critical Environmental Concern (Alternative A)**
- Map 131. Special Designations - Areas of Critical Environmental Concern (Alternative B)**
- Map 132. Special Designations - Areas of Critical Environmental Concern (Alternative D)**
- Map 133. Socioeconomic Resources - Tribal Census Tracts in the Wind River Indian Reservation**
- Map 134. Mineral Resources - Designated Development Area (Alternative D)**
- Map 135. Special Designations - Reference and Education Area (Alternative D)**
- Map 136. Cumulative Impact Analysis Area - Greater Sage-Grouse**
- Map 137. Cumulative Impact Analysis Area - Greater Sage-Grouse - Split Estate**
- Map 138. Cumulative Impact Analysis Area - Fourth Order Hydrologic Units**
- Map 139. Cumulative Impact Analysis Area - Wyoming Basin Ecoregion and Continental Divide National Scenic Trail**

**Map 140. Cumulative Impact Analysis Area - National Historic Trail**

**Map 141. Lands Proposed for Exchange by Members of the Public**

**Map 142. General Location Names**

**Map 143. Mineral Resources - Areas with Master Leasing Plans (Alternative D)**

**Map 144. Mineral Resources - Modifications to Oil and Gas Management (Alternative D)**

# Appendix C. Recreation Management Area Forms

## Recreation Program Objectives

This appendix is focused solely on detailing the management of distinct Special Recreation Management Areas (SRMAs). Additional goals, objectives, and management actions for the Distinct Extensive Recreation Management Areas (ERMAs) and the rest of the planning area is detailed in Chapter 2. Table C.1, “Lander Field Office Recreation and Visitor Services Objectives” (p. 1367) below, displays the standard recreation objectives that apply to the entire Lander Field Office regardless of SRMA or ERMA status. Table C.2, “Difference in Recreation Management Areas” (p. 1368) below, displays the difference between SRMAs, Distinct ERMAs, and the rest of the planning area.

**Table C.1. Lander Field Office Recreation and Visitor Services Objectives**

<b>Lander Field Office Wide Objective(s)</b>
<ul style="list-style-type: none"> <li>● <b>Resource Protection Objective:</b> Increase awareness, understanding, and a sense of stewardship in recreational activity participants so their conduct safeguards cultural and natural resources as defined by Wyoming Standards for Public Land Health or area-specific (such as Areas of Critical Environmental Concern and Wild and Scenic Rivers) objectives.</li> <li>● <b>Visitor Health and Safety Objective:</b> Ensure that visitors are not exposed to unhealthy or unsafe human-created conditions (defined by a repeat or recurring incident in the same year, of the same type, in the same location, due to the same cause).</li> <li>● <b>Use/User Conflict Objective:</b> Achieve a minimum level of conflict between recreation participants and (1) other resource/resource uses sufficient to enable the achievement of identified land use plan goals, objectives, and actions; (2) private land owners sufficient to curb illegal trespass and property damage; and (3) other recreation participants sufficient to maintain a diversity of recreation activity participation.</li> <li>● <b>Objectives Ensuring Facilitation of Hunting Heritage and Wildlife Conservation.</b> <ul style="list-style-type: none"> <li>○ Expand Wildlife-Dependent Recreation opportunities on federal land</li> <li>○ Improve and enhance access to public lands important for Wildlife-Dependent Recreation opportunities</li> <li>○ Ensure the enjoyment of Wildlife-Dependent Recreation among various demographic groups</li> <li>○ Facilitate trophy/high quality hunting opportunities in Wyoming Game and Fish Department hunt units targeted for special management criteria.</li> </ul> </li> </ul>



**Table C.2. Difference in Recreation Management Areas**

	SRMA	Distinct ERMA	The Rest of the Lander Field Office
<i>Recreation Opportunity Management</i>	Managed to <b>provide specific opportunities and settings</b> in response to visitor demand.	Managed to <b>provide diverse opportunities, as necessary to achieve planning objectives.</b>	Managed to <b>provide a diversity of recreation opportunities and settings.</b>
<i>Allowable Uses and Management Actions</i>	Allowable uses and management actions must <b>sustain or enhance recreation settings characteristics.</b>	Allowable uses and management actions <b>address recreation-tourism issues, activities, conflicts, and/or particular recreation setting.</b>	Management Actions and allowable uses may be necessary to protect resources or investments.
<i>Management Common to All Areas</i>	All areas are managed to meet statutory requirements to ensure resource protection, human health and safety, and reduce conflict as well as achieve other program planning objectives.		
ERMA Extensive Recreation Management Area SRMA Special Recreation Management Area			

### Existing Management (Alternative A)

The 1987 Resource Management Plan (RMP) was drafted under old planning guidance and no longer meets the minimum planning decision requirements directed at planning for recreation and visitor services. Table C.3, “Existing Recreation Management (Alternative A)” (p. 1368) below, outlines the general management direction detailed in the existing plan.

**Table C.3. Existing Recreation Management (Alternative A)**

Area Name	Area Type	Management Focus (Planning Objective)
National Historic Trail	SRMA	A management plan will provide detailed planning for special recreation management areas.
Continental Divide National Scenic Trail	SRMA	A management plan will provide detailed planning for special recreation management areas.
South Pass	SRMA	Management will be oriented toward maintaining recreational opportunities in terms of rustic, open-space settings.
<ul style="list-style-type: none"> <li>● Green Mountain Management Unit</li> <li>● Gas Hills Management Unit               <ul style="list-style-type: none"> <li>○ Lysite Badlands</li> <li>○ Sweetwater Rocks</li> <li>○ Copper Mountain</li> </ul> </li> <li>● Beaver Creek Management Unit               <ul style="list-style-type: none"> <li>○ Government Draw</li> <li>○ Beaver Rim</li> </ul> </li> <li>● Lander Slope Management Unit</li> </ul>	ERMA	Recreation management will emphasize the resolution of user conflicts/competing uses and provide for resource protection.

Area Name	Area Type	Management Focus (Planning Objective)
<ul style="list-style-type: none"> <li>East Fork Management Unit</li> <li>Dubois Management Unit <ul style="list-style-type: none"> <li>Warm Springs Canyon</li> </ul> </li> </ul>		
Red Canyon Management Unit	ERMA	No direction provided.
Whiskey Mountain Management Unit	ERMA	The BLM will cooperate with the Wyoming Game and Fish Department on non-consumptive wildlife visitor use management.
Dubois Badlands	ERMA	The area will be managed in its natural state. Recreation management will emphasize resolving competing uses and providing for resource protection.
BLM Bureau of Land Management ERMA Extensive Recreation Management Area SRMA Special Recreation Management Area		

As Table C.3, “Existing Recreation Management (Alternative A)” (p. 1368) demonstrates, historic planning for the recreation resource provided little future direction. This lack of direction resulted in several instances where visitor services and management actions were disjointed and sometimes in direct conflict with one another. For existing management to be in compliance with the new Land Use Planning Guidance, the management direction would need to be substantially overhauled so as to provide a similar level of detail contained under alternatives B and C. Table C.4, “Special Recreation Management Areas” (p. 1369) and Table C.5, “Distinct Extensive Recreation Management Areas” (p. 1370) below, display the recreation management areas for the various alternatives.

**Table C.4. Special Recreation Management Areas**

Area Name	Alternative A	Alternative B	Alternative C	Alternative D
CDNST Destination SRMA <ul style="list-style-type: none"> <li>Alkali Basin RMZ</li> <li>Sweetwater Mining RMZ</li> </ul>	SRMA  (See Table C.3, “Existing Recreation Management (Alternative A)” (p. 1368))	SRMA	See CDNST ERMA	Same as Alternative B
National Trails Undeveloped SRMA	SRMA (See Table C.3, “Existing Recreation Management (Alternative A)” (p. 1368))	SRMA	See NHT and CDNST ERMA	Same as Alternative B (fewer acres)
Dubois Millsite Community SRMA	Planning area wide ERMA	SRMA	SRMA	Same as Alternative B
Lander Community SRMA <ul style="list-style-type: none"> <li>Johnny Behind The Rocks RMZ</li> <li>Sinks Canyon RMZ</li> <li>The Bus @ Baldwin Creek RMZ</li> </ul>	Planning area wide ERMA	SRMA	Planning area wide ERMA	Same as Alternative B (fewer acres)

Area Name	Alternative A	Alternative B	Alternative C	Alternative D
National Historic Trails Destination SRMA <ul style="list-style-type: none"> <li>National Historic Trails Auto Tour Route RMZ</li> <li>National Historic Trails Group Use RMZ</li> </ul>	SRMA (see Table C.3, "Existing Recreation Management (Alternative A)" (p. 1368))	SRMA	See NHT ERMA	SRMA
Sweetwater Canyon Undeveloped SRMA	Planning area wide ERMA	SRMA	Distinct ERMA	SRMA
Sweetwater Rocks Undeveloped SRMA	Distinct ERMA	SRMA	Distinct ERMA	SRMA (fewer acres than Alternative B)
CDNST Continental Divide National Scenic Trail ERMA Extensive Recreation Management Area NHT National Historic Trail RMZ Recreation Management Zone SRMA Special Recreation Management Area				

**Table C.5. Distinct Extensive Recreation Management Areas**

Area	Alternative A	Alternative B	Alternative C	Alternative D
Castle Gardens ERMA Copper Mountains WSA Dubois Badlands WSA	Distinct ERMA	Distinct ERMA	Distinct ERMA	Planning area wide ERMA
Beaver Creek Nordic Ski Area	Planning area wide ERMA	Distinct ERMA	Distinct ERMA	Distinct ERMA
Coalmine/Government Draw	Distinct ERMA	Distinct ERMA	R&PP Lease	Same as Alternative C
Green Mountain ERMA and ACEC Lander Slope/Red Canyon ACECs Whiskey Mountain/Eastfork ACECs	Distinct ERMA	Distinct ERMA	Distinct ERMA	Same as Alternative C
Muskrat Basin ERMA Agate Flats ERMA	Planning area wide ERMA	Distinct ERMA	Distinct ERMA	Same as Alternative A
NHTs ERMA (¼ mile on either side of the Trail not contained within a SRMA)	SRMA (see Table C.4, "Special Recreation Management Areas" (p. 1369))	Distinct ERMA (Portions of the trail) (more acres than Alternative C)	Distinct ERMA (entire trail) (fewer acres than Alternative B)	Same as Alternative B
CDNST ERMA (Trail area not contained within a SRMA)	SRMA (see Table C.4, "Special Recreation Management Areas" (p. 1369))	Distinct ERMA (¼ mile on either side of portions of the trail) (fewer acres than Alternative C)	Distinct ERMA (¼ mile on either side of the entire trail) (more acres than Alternative B)	Same as Alternative B
ACEC Area of Critical Environmental Concern CDNST Continental Divide National Scenic Trail ERMA Extensive Recreation Management Area NHT National Historic Trail R&PP Recreation and Public Purposes SRMA Special Recreation Management Area WSA Wilderness Study Area				

## Continental Divide National Scenic Trails (Alternatives B and D)

**Table C.6. Alkali Basin Recreation Management Zone**

SUPPORTING INFORMATION	
<b>This documents the rationale for consideration of the Special Recreation Management Area (SRMA) in the planning process and, if selected, designation of the SRMA in the record of decision.</b>	
This SRMA is necessary to accommodate national visitor demand for destination oriented long distance trail opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers, through community involvement workshops, and through the enabling legislation for the Continental Divide National Scenic Trail (CDNST). The CDNST in the area runs along a high plateau that provides overlook views of the great divide basin, numerous prairie and mountain wildlife species, and is a physically challenging trail. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.	
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS	
<b>Objectives describe the intended recreation activities, experiences and benefits. SRMAs may be subdivided into RMZs with discrete objectives.</b>	
<b>Objective Statement:</b> The Alkali Basin RMZ of the CDNST Destination SRMA will be sustained or enhanced for thru-travelers and middle country hunters (fall) to engage in horseback riding, hiking, hunting (fall), and mountain biking, so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:	
<b>Activities:</b> Horse riding/packing, Hiking/backpacking, Mountain biking, and Hunting (fall)	
<b>Experiences:</b> Enjoying the sensory experience of a natural landscape, Testing endurance, Escaping everyday responsibilities and, and Being isolated and independent.	
<b>Benefits:</b> Enhanced awareness and understanding of nature, Closer relationship with the natural world, Improved opportunity to view wildlife close-up, Improved mental health, Improved physical health, Greater retention of distinctive natural landscape features, and Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits.	
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS	
<b>Physical, social and operational recreation setting qualities to be maintained or enhanced.</b>	
<b>Physical Characteristics:</b> The CDNST in the area will continue to be on or near motorized routes but at least a ½ mile from improved roads, though they may be in sight. The natural setting of the area may have modifications that would be noticed but not draw the attention of an observer wandering through the area (Visual Resource Management Class II). Facilities and structures in support of recreation and other uses will continue to be rare.	
<b>Social Characteristics:</b> Average encounters per day during peak CDNST use season (July-September), will not exceed for three consecutive years, 3 encounters per day at known campsite locations, and 6 encounters per day on travel routes. Usual group size will be small.	
<b>Operational Characteristics:</b> 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles, in addition to nonmotorized mechanized use will continue to be allowed when the trail is on existing or open roads. Motorized vehicles are not allowed on areas where the trail travels cross-country off existing roads or where the trail travels along a closed road. Onsite controls and services will continue to be present but subtle. Offsite services and controls will be provided in the minimum amount necessary to reach management objectives.	
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS	
<b>Land use plan-level management actions and allowable use decisions for the recreation and visitor services program and other programs necessary to: support the recreation objective, maintain or enhance the desired RSCs, address visitor health/safety, mitigate recreation impacts on cultural/natural resources, and reduce use/user conflicts.</b>	

<p><b>Recreation and Visitor Services Program:</b></p> <ul style="list-style-type: none"> <li>• Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</li> <li>• The area will be closed to competitive events. Other Special Recreation Permits will be allowed in this area so long as setting condition and outcome objectives can be maintained.</li> <li>• Continue to enhance the availability of dependable non-potable water sources for trail hikers.</li> <li>• Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.</li> <li>• Existing offsite and onsite visitor orientation (kiosk, signs, and informational brochures) will be maintained and enhanced.</li> <li>• Consider the use of a memorandum of understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance the area.</li> </ul> <p><b>Other Programs:</b></p> <ul style="list-style-type: none"> <li>• Class II Visual Resource,</li> <li>• Additional Allowable Use Decisions for the CDNST are contained in Table 2.32, “7000 Special Designations (SD) – Congressionally Designated Trails” (p. 157).</li> </ul>
<p style="text-align: center;"><b>IMPLEMENTATION DECISIONS</b></p> <p style="text-align: center;"><b>Actions to achieve or implement land use plan decisions. If implementation decisions are included in the land use planning document they must have site-specific environmental analysis and be clearly distinguished as appealable decisions.</b></p> <p><b>Implementation Decisions:</b> (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)</p>

**Table C.7. Sweetwater Mining Recreation Management Zone**

<p style="text-align: center;"><b>SUPPORTING INFORMATION</b></p> <p>This Special Recreation Management Area (SRMA) is necessary to accommodate national and regional visitor demand for destination oriented long distance trail and day use trail hiking/learning opportunities in a richly historic area. This demand has been identified by onsite customers, through community involvement workshops, and through the enabling legislation for the Continental Divide National Scenic Trail (CDNST). The CDNST in the area runs through the historic Sweetwater Mining District where historic remains are interpreted and stabilized for public enjoyment. Several existing facilities in the area provide camping, and day use trail/driving for pleasure opportunities. The area also contains a high diversity of vegetation and wildlife, providing additional opportunities for sightseeing and wildlife oriented recreation. SRMA management will sustain and enhance these amenities, as well as accommodate the visitor demand.</p>
<p style="text-align: center;"><b>SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS</b></p> <p><b>Objective Statement:</b> Manage the Sweetwater Mining District RMZ of the CDNST Destination SRMA for day user and CDNST thru-travelers to engage in cultural site visitation, driving for pleasure, photography, horseback riding, hiking, and mountain biking, so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:</p> <p><b>Activities:</b> Cultural site visitation, Driving for pleasure, Photography, Horse riding/packing, Developed site camping, Hiking/backpacking, and Mountain biking.</p> <p><b>Experiences:</b> Testing your endurance, Enjoying the closeness of friends and family, Learning more about things here, Feeling good about the way our cultural heritage is being protected, and Developing skills and abilities.</p> <p><b>Benefits:</b> Improved capacity for outdoor physical activity, Improved mental health, Stronger ties with my family and friends, Greater respect for cultural heritage, Increased appreciation of area’s cultural heritage, Greater opportunity for people with different skills to exercise in the same place, Greater household awareness of and appreciation for our cultural heritage, Greater protection of area historic structures and archeological sites, and Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits.</p>
<p style="text-align: center;"><b>RECREATION SETTING CHARACTERISTIC DESCRIPTIONS</b></p>

**Physical Characteristics:** The CDNST in the area will continue to be on or near motorized routes but at least a ½ mile from improved roads, though they may be in sight. The natural setting of the area may have modifications that would be noticed but not draw the attention of an observer wandering through the area (Visual Resource Management Class II). Facilities and structures in support of recreation and other uses will continue to be rare along the CDNST. Additional facilities and structures may be added in areas out of sight or away from the CDNST.

**Social Characteristics:** On the CDNST usually 7-14 encounters per day will occur off travel routes (e.g., staging areas, campgrounds), and 15-29 encounters per day en route. Usual group size is small to moderate. Encounters will largely increase around developed sites and roads adjacent to the CDNST.

**Operational Characteristics:** 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized use, are allowed in the area. Motorized uses will not be encouraged or facilitated on the CDNST. Motorized vehicles are not allowed off existing roads, on areas where the trail travels cross-country off existing roads, or where the trail travels along a closed road or nonmotorized trail. Onsite controls and services will be present but harmonize with the natural and historic environment.

#### **MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS**

##### **Recreation and Visitor Services Program:**

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Motorized and mechanized travel in the SRMA is limited to existing roads and trails.
- Work with the local back country horsemen to teach equine Leave No Trace, as well as potentially provide additional horseback facilities (corrals etc.) and trails.
- Investigate opportunities to re-route the CDNST near Phelps-Dodge Bridge, so thru-hikers do not have to parallel the Atlantic City-Three Forks County Road.
- The CDNST through the area will be closed to competitive events, however other Special Recreation Permits will be permitted so long as setting condition and outcome objectives can be maintained.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Work with partners to provide additional interpretation of the historic buildings and other remnants.
- Implement the Miners Delight Interpretation Plan.
- Develop SRMA information and interpretation that connects trail opportunities with developed sites and campgrounds.
- Develop better onsite visitor orientation so visitors to the South Pass State Park are aware of ½ and 1 day CDNST and Volksmarch trail opportunities in the area.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols during the trails high use season (June-September).

##### **Other Programs:**

- Class II Visual Resource,
- Additional Allowable Use Decisions for the CDNST are contained in Table 2.32, “7000 Special Designations (SD) – Congressionally Designated Trails” (p. 157).

#### **IMPLEMENTATION DECISIONS**

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## Designated Trails Undeveloped Special Recreation Management Area (Alternatives B and D)

**Table C.8. Designated Trails Recreation Management Zone**

SUPPORTING INFORMATION
<p>This Special Recreation Management Area (SRMA) is necessary to accommodate local and national visitor demand for undeveloped Congressionally Designated Trail opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers, through community involvement workshops, visitor surveys, and through the enabling legislation of the National Historic and Scenic Trails. The area contains 3 Congressionally Designated Trails including: Oregon and California National Historic Trails and the Continental Divide National Scenic Trail (CDNST). The area has abundant prairie wildlife, nearly pristine Wyoming Basin viewshed, and a high probability for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.</p>
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
<p><b>Objective Statement:</b> The Designated Trails Undeveloped SRMA will be sustained or enhanced for individuals or small groups of historic trail 'rut buffs', CDNST thru-hikers, and middle country hunters (fall season) to engage in cultural site visitation, driving for pleasure, photography, horseback riding, hunting, and hiking so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:</p> <p><b>Activities:</b> Cultural site visitation, Driving for pleasure/photography, Horseback riding, Hiking/backpacking, and Hunting.</p> <p><b>Experiences:</b> Enjoying exploring on my own or in small groups, Enjoying nature, Reflecting on the historical significance of the trail and the people who traveled it, and Feeling good about solitude.</p> <p><b>Benefits:</b> Better mental health and health maintenance, Greater respect and appreciation for the areas cultural history, Greater appreciation of the outdoors environment, Closer relationship with the natural world, Greater household awareness of and appreciation of our cultural heritage, Protection of cultural sites, Maintenance of distinctive historical recreation setting, and Increased sense of stewardship for the resource.</p>
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
<p><b>Physical Characteristics:</b> Majority of the area is on or near 4-wheel drive roads, but at least ½ mile from all improved roads, though they may be in sight. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Trails may exist but do not exceed standard to carry expected use. Facilities and structures are extremely rare. However, nonmotorized trail opportunities will be the focus for visitor services/facilities in this area.</p> <p><b>Social Characteristics:</b> Usually fewer than 3-6 encounters per day on the Congressionally Designated Trails. Usually group sizes are small in relation to the surrounding area.</p> <p><b>Operational Characteristics:</b> 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized use, are allowed in the area. Motorized uses will not be encouraged or facilitated in the area. Motorized vehicles are not allowed off existing roads, on areas where the trail travels cross-country off existing roads, or where the trail travels along a closed road or nonmotorized trail. Onsite controls and services present but subtle. Minimum amount necessary to achieve planning objectives.</p>
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

**Recreation and Visitor Services Program:**

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- The Bureau of Land Management (BLM) and partners will review (using the BLM's contrast rating system) existing facilities and interpretive exhibits to ensure designs harmonize with the characteristic landscape; designs out of character with the landscape will be modified so as not to overpower the landscape.
- Emergency closures will be imposed when necessary to protect the historic trail resource.
- The BLM will not authorize temporary: facilities, campsites, or staging/parking areas to support Special Recreation Permits within this RMZ. Motorized tours will not be authorized in this RMZ.
- In this RMZ, the BLM will authorize special recreation permits for trail oriented nonmotorized group activities consistent with the outcome objective and recreation setting prescriptions above.
- No competitive events will be authorized in this RMZ.
- Additional management actions will be applied as needed to reduce unplanned visitor impacts (vandalism, social trails, and litter etc.). Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all offsite visitor information.
- Some light onsite visitor orientation (kiosk and trail markers) will be developed.
- No new onsite interpretation will be developed on the National Historic Trail in this area.
- Engage local businesses and other partners to ensure promotional material does not over advertise the area.
- Solicit partnerships and cooperative agreements to: Monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols during the trails high use season (June-September).

**Other Programs:**

- Class II Visual Resource.
- Additional Allowable Use Decisions for the CDNST and the National Historic Trails are contained in Table 2.32, "7000 Special Designations (SD) – Congressionally Designated Trails" (p. 157).

**IMPLEMENTATION DECISIONS**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## Dubois Mill Site Special Recreation Management Area (Alternatives B and D)

**Table C.9. Dubois Mill Site Recreation Management Zone**

SUPPORTING INFORMATION
<p><b>This documents the rationale for consideration of the Special Recreation Management Area (SRMA) in the planning process and, if selected, designation of the SRMA in the record of decision.</b></p>
<p>This SRMA is necessary to accommodate local visitor demand for close to home nonmotorized recreation opportunities; this demand has been identified by onsite customers, through community involvement workshops, and through the Dubois Gateway Plan. The public lands in this area are adjacent to newly acquired lands managed by the town of Dubois as open space and a recreational use area for the citizens. These newly acquired lands currently provide undeveloped nonmotorized access to large blocks of Bureau of Land Management (BLM)-administered land, a Wyoming Game and Fish Department habitat management area, and U.S. Department of Agriculture Forest Service lands. The public lands in the area contain a multitude of wildlife oriented recreation opportunities as well as several scenic vistas. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.</p>
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
<p><b>Objectives describe the intended recreation activities, experiences and benefits. SRMAs may be subdivided into RMZs with discrete objectives.</b></p>



**Objective Statement:** The Dubois Mill-Site Community SRMA will be sustained or enhanced for nonmotorized recreationists to engage in hiking, walking, horseback riding, wildlife viewing, and hunting so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

**Activities:** Hiking, Walking, Running, Horseback riding, Wildlife viewing, and Hunting.

**Experiences:** Escaping everyday responsibilities for a while, Enjoying frequent access to outdoor physical activity in a natural environment, and Enjoying the areas wildlife, scenery, views, and aesthetics.

**Benefits:** Better mental and physical health, Increased satisfaction with life, Greater cultivation of an outdoor oriented lifestyle, Greater understanding and respect for private property, Heightened sense of community pride and satisfaction, Greater environmental awareness and stewardship, Greater aesthetic appreciation, and Preservation of this special place.

#### RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS

##### Physical, social and operational recreation setting qualities to be maintained or enhanced.

**Physical Characteristics:** The area is within ½ mile of the town of Dubois. The natural setting may have modifications that would be noticed but not draw the attention of an observer wandering through the area. Trails may exist but will not exceed standard and density to carry expected use. Facilities and structures are rare and within close proximity to highway/parking area.

**Social Characteristics:** Usually 7-14 encounters with other groups per day.

**Operational Characteristics:** Mountain bikes and other mechanized use, but all use is nonmotorized. Onsite controls and services are present, but harmonize with the natural environment. Offsite services such as an area brochure will be available.

#### MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

##### Land use plan-level management actions and allowable use decisions for the recreation and visitor services program and other programs necessary to: support the recreation objective, maintain or enhance the desired RSCs, address visitor health/safety, mitigate recreation impacts on cultural/natural resources, and reduce use/user conflicts.

##### Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Pursue partnerships with the town of Dubois and other Dubois Gateway Plan partners to ensure continued enforcement of travel management designations.
- Establish light connecting nonmotorized loop trails, as discussed in community project plan.
- Develop partnerships to pursue land acquisitions and easements necessary to maintain characteristic landscape, natural setting, and targeted experiences and benefits.
- Ensure targeted experiences and benefits, as well as recreation setting information is included and explained in all visitor information.
- Promote the RMZ to the Dubois community through partnerships with local community businesses and the town of Dubois.
- Light interpretation may be developed to facilitate targeted outcomes; utilize community members, academic organizations, and community centers to meet needs for higher levels of education and interpretation.
- The BLM will assist the community with project design, technical expertise, and other services in order to help achieve the objectives outlined in the Dubois Gateway Plan document.
- Develop a memorandum of understanding between the BLM, Dubois Gateway Plan members, and the community of Dubois to ensure continued cooperative community stewardship of public lands contained within the RMZ.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols (June-September).

##### Other Programs:

- Closed to Fluid Mineral Leasing (alternatives B and D)
- Closed to Geothermal Development (alternatives B and D)

- Closed to Geophysical Exploration (alternatives B and D)
- Closed To Mineral Material Sales and Free Use Permits (alternatives B and D)
- New rights-of-ways are excluded (alternatives B and D)
- Renewable Energy Development is excluded (alternatives B and D)
- Petition to withdrawal from entry under the 1872 Mining Law (alternatives B and D)
- The SRMA is managed as a Class II Visual Resource (alternatives B and D)
- Closed to motorized vehicle use (alternatives B and D)

#### IMPLEMENTATION DECISIONS

**Actions to achieve or implement land use plan decisions. If implementation decisions are included in the land use planning document they must have site-specific environmental analysis and be clearly distinguished as appealable decisions.**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## Dubois Mill Site Special Recreation Management Area (Alternative C)

**Table C.10. Dubois Mill Site Recreation Management Zone**

SUPPORTING INFORMATION
<b>This documents the rationale for consideration of the Special Recreation Management Area (SRMA) in the planning process and, if selected, designation of the SRMA in the record of decision.</b>
Same as alternatives B and D except for the following: SRMA management will sustain and enhance motorized access to the area as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
<b>Objectives describe the intended recreation activities, experiences and benefits. SRMAs may be subdivided into RMZs with discrete objectives.</b>
<p><b>Objective Statement:</b> The Dubois Mill-Site Community SRMA will be sustained or enhanced for nonmotorized and motorized recreationists to engage in hiking, walking, horseback riding, wildlife viewing, hunting, and motorized trail riding, so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:</p> <p><b>Activities:</b> Hiking, Walking, Running, Horseback riding, Wildlife viewing, Hunting, and Motorized trail riding.</p> <p><b>Experiences:</b> Escaping everyday responsibilities for a while, Developing skills and abilities, Enjoying having access to close to home outdoor amenities, Enjoying risk taking, and Sharing/talking about your equipment with others.</p> <p><b>Benefits:</b> Better mental and physical health, Increased satisfaction with life, Greater cultivation of an outdoor oriented lifestyle, Improved outdoor recreation skills, Greater sense of adventure, Enhanced sense of freedom, Greater opportunity for people with different skills to exercise in the same place, Improved physical capacity to do my favorite activity, Greater understanding and respect for private property, and Heightened sense of community pride and satisfaction.</p>
RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS
<b>Physical, social and operational recreation setting qualities to be maintained or enhanced.</b>

**Physical Characteristics:** Within ½ mile of the town of Dubois. Motorized use will be allowed on the designated trail through the area. Natural setting may have modifications that would be noticed, but not draw the attention of an observer wandering through the area. Trails may exist but do not exceed standard and density to carry expected use. Facilities and structures are rare and within close proximity to highway/parking area.

**Social Characteristics:** Usually 7-14 encounters with other groups per day.

**Operational Characteristics:** Motorized use will be allowed on the identified trail (existing access road); the area southwest of the existing access road along Jakey's Fork Rim will be closed to motorized vehicle use. Onsite controls and services are present, but harmonize with the natural environment. Offsite services such as an area brochure will be available.

#### **MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS**

**Land use plan-level management actions and allowable use decisions for the recreation and visitor services program and other programs necessary to: support the recreation objective, maintain or enhance the desired RSCs, address visitor health/safety, mitigate recreation impacts on cultural/natural resources, and reduce use/user conflicts.**

##### **Recreation and Visitor Services Program:**

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Pursue partnerships with the town of Dubois and other Dubois Gateway Plan partners to ensure continued enforcement of travel management designations.
- Establish light connecting nonmotorized loop trails as discussed in community project plan.
- Work with the state trails program to ensure effective enforcement of motorized travel limitations in the area.
- Motorized seasonal closures will be implemented with gates at the best available location for enforcement and to ensure control of motorized use.
- The area will be closed to over snow travel.
- Develop partnerships to pursue land acquisitions and easements necessary to maintain characteristic landscape, natural setting, and targeted experiences and benefits.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Promote the RMZ to the Dubois community through partnerships with local community businesses and the town of Dubois.
- Light interpretation may be developed to facilitate targeted outcomes; utilize community members, academic organizations, and community centers to meet needs for higher levels of education and interpretation.
- The BLM will assist the community with project design, technical expertise, and other services, in order to help achieve the objectives outlined in the Dubois Gateway Plan document.
- Develop a memorandum of understanding between the Bureau of Land Management, Dubois Gateway Plan members, and the community of Dubois to ensure continued cooperative community stewardship of public lands contained within the RMZ.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols (June-September).

#### **IMPLEMENTATION DECISIONS**

**Actions to achieve or implement land use plan decisions. If implementation decisions are included in the land use planning document they must have site-specific environmental analysis and be clearly distinguished as appealable decisions.**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## Lander Community Special Recreation Management Area (Alternatives B and D)

**Table C.11. Johnny Behind the Rocks Recreation Management Zone**

SUPPORTING INFORMATION
<p>This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for close to home nonmotorized recreation opportunities in the Lander area; this demand has been identified by onsite customers and through community involvement workshops. The public lands in this area are located within a 15 minute drive of the town of Lander. The area currently provides a limited amount of nonmotorized trail opportunities, with diverse and appealing topography. The public lands in the area also contain a multitude of wildlife oriented recreation opportunities as well as several scenic vistas including a prairie waterfall. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.</p>
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
<p><b>Objective Statement:</b> The Johnny Behind the Rocks RMZ of the Lander Community SRMA will be sustained or enhanced for nonmotorized recreationists to engage in horseback riding, hiking, trail running, wildlife viewing, and mountain biking so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:</p> <p><b>Activities:</b> Horseback riding, Trail running, Mountain biking, Hiking, and Wildlife viewing.</p> <p><b>Experiences:</b> Enjoying the sensory experience of a natural landscape, Enjoying exercise and physical fitness, Developing skills and abilities, Enjoying having access to close to home outdoor amenities, and Feeling that this community is a special place to live.</p> <p><b>Benefits:</b> Improved mental and physical health, Greater connection to nature, Improved opportunity to view wildlife close up, Greater sense of place, Improved outdoor recreation skills, Heightened sense of satisfaction with our community, and Reduced adverse human impacts such as litter, vegetative trampling, and unplanned trails.</p>
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
<p><b>Physical Characteristics:</b> Majority of the area is on or near improved country roads, but at least ½ mile from any highways, except in the area directly adjacent to Highway 287. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Facility and trail development will focus on sufficient densities and developments to provide for a ¾ day (6-8 hours) of use. Facilities and structures will continue to be rare and co-located within close proximity to highway/parking area.</p> <p><b>Social Characteristics:</b> Usually 3-6 encounters per day off travel routes and 7-15 encounters per day on travel routes. Usual group size is small.</p> <p><b>Operational Characteristics:</b> Excluding county roads, adjacent highway, the Blue Ridge Road, and livestock permittee access to range improvements; the area will be managed for mountain bikes and non motorized use. Onsite controls and services are present, but harmonize with the natural environment.</p>
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS
<p><b>Recreation and Visitor Services Program:</b></p> <ul style="list-style-type: none"> <li>• Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.</li> <li>• Implement closures to motorized vehicle use; utilize administrative access agreements to allow for the maintenance of range improvements.</li> <li>• Mechanized use will be limited to designated roads and trails; these trails will be identified through the environmental assessment process in consideration of recommendations from partners such as the grazing permittees, an established 'friends' group or club, and other stakeholders or members of the public.</li> <li>• Pursue a land trade and access agreements for parcels in and adjacent to this RMZ.</li> <li>• Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all offsite visitor information.</li> <li>• Engage local sporting good businesses and other partners in the development and distribution of a brochure and/or area guide book.</li> <li>• Some light onsite visitor orientation (kiosk and trail markers) will be developed.</li> <li>• This RMZ will be managed in a custodial fashion, until which time that a 'friends group' or local club demonstrates a willingness to be involved in the management and stewardship of the site.</li> </ul>

- A memorandum of understanding (MOU) will be developed between the Bureau of Land Management (BLM) and pertinent partners such as livestock grazing permittees, local sporting good retailers, and an established friends group or club. The MOU will assign responsibility for the stewardship and development of the site and related amenities; the majority of the cost and labor responsibilities associated with initial investments and maintenance of the identified trails and related amenities will be born upon the established friends group or club.
- The BLM and other partners will provide matching contributions when funding and labor pool allows.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols May-November.

**Other Programs:**

- No Surface Occupancy for Oil and Gas Development (alternatives B and D)
- Closed to Geothermal Development (alternatives B and D)
- Closed to Geophysical Exploration (alternatives B and D)
- Closed To Material Sales and Free Use Permits (alternatives B and D)
- Closed to sand and gravel disposal (alternatives B and D)
- New rights-of-ways are excluded (alternatives B and D)
- Renewable Energy Development is excluded (alternatives B and D)
- Closed to salable materials (alternatives B and D)
- Petition to withdrawal from entry under the 1872 Mining Law (alternatives B and D)
- The SRMA is managed as a Class II Visual Resource (alternatives B and D)
- Closed to motorized vehicle use (alternatives B and D)

**IMPLEMENTATION DECISIONS**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

**Table C.12. Sinks Canyon Recreation Management Zone**

<b>SUPPORTING INFORMATION</b>
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for close to home nonmotorized muscle powered recreation opportunities in the Lander area; this demand has been identified by onsite customers and through community involvement workshops. The area currently provides a limited amount of nonmotorized trail opportunities, and world renowned climbing opportunities. Adjacent to Wyoming State Parks and U.S. Department Agriculture, Forest Service (Forest Service) lands, provide additional day hiking and overnight camping opportunities. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
<b>SRMA/RECREATION MANAGEMENT ZONE OBJECTIVE(S) DECISIONS</b>
The Sinks Canyon Climbing area of the Lander Valley Community SRMA will be sustained or enhanced for muscle-powered recreationists to engage in climbing and hiking so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes below:
<b>Activities:</b> Climbing, and Hiking.
<b>Experiences:</b> Enjoying risk taking adventure, Developing skills and abilities, Enjoying meeting new people, Enjoying teaching others about the outdoors, Feeling that this community is a special place to live, and Feeling good about how this attraction is being used and enjoyed.
<b>Benefits:</b> Improved mental and physical health, Improved skills for outdoor enjoyment, Improved leadership abilities, Improved teamwork and cooperation, Better sense of place, Heightened sense of satisfaction with our community, Increased local tourism revenue, and Greater value-added local services/industry.
<b>RECREATION SETTING CHARACTERISTIC DESCRIPTIONS</b>

**Physical Characteristics:** Majority of the area is on or near improved country roads, but at least ½ mile from any highways, except in the area directly adjacent to Highway 287. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Trails may exist but do not exceed standard and density to carry expected use. Facilities and structures are rare and isolated.

**Social Characteristics:** People seem to be everywhere, but human contact remains intermittent.

**Operational Characteristics:** Excluding county roads, adjacent highway, adjacent United States Forest Service (USFS) and private roads; motorized use will not be allowed on Bureau of Land Management (BLM)-administered lands. Onsite controls and services are present, but harmonize with the natural environment. Majority of services are provided by the Wyoming State Parks and USFS.

#### MANAGEMENT ACTIONS & ALLOWABLE USE DECISIONS

##### Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement closures to mechanized and motorized travel (Alternative B only).
- Mechanized and motorized travel limited to designated roads and trails (alternatives A and C).
- Work with local climbing community and adjacent land management agencies to maintain this area.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Engage local sporting good businesses and other partners in the development and distribution of a brochure and/or area guide book.
- Some onsite visitor orientation (kiosk and trail markers) will be developed.
- A memorandum of understanding will be developed between the BLM and pertinent partners such as local sporting goods retailers, Wyoming State Parks, the National Outdoor Leadership School, and an established friends group or club.
- The BLM and other partners will provide matching contributions when funding and labor pool allows.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols.

##### Other Programs:

- No Surface Occupancy for Oil and Gas Development (alternatives A, B, and D)
- Closed to Geothermal Development (alternatives A, B, and D)
- Closed to Geophysical Exploration (alternatives A, B, and D)
- Closed To Material Sales and Free Use Permits (alternatives A, B, and D)
- New rights-of-ways are excluded (alternatives A, B, and D)
- Renewable Energy Development is excluded (alternatives A, B, and D)
- Petition to withdrawal from entry under the 1872 Mining Law (Alternative B)
- The SRMA is managed as a Class II Visual Resource (alternatives A, B, and D)
- Mineral entry requires a Plan of Operations (alternatives A and D)
- Closed to motorized vehicle use (alternatives B and D)
- Motorized use limited to designated roads (Alternative A)
- Mechanized use limited to designated roads and trails (Alternative B)

#### IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

**Table C.13. The Bus @ Baldwin Creek Recreation Management Zone**

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for close to home nonmotorized recreation opportunities in the Lander area; this demand has been identified by onsite customers and through community involvement workshops. The public lands in this area are located within walking and pedal biking distance from the town of Lander. The area currently provides a limited amount of nonmotorized trail opportunities, with diverse and appealing topography, and some slick rock formations. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS

*Appendix C Recreation Management Area Forms  
Lander Community Special Recreation Management  
Area (Alternatives B and D)*

The Bus @ Baldwin Creek RMZ of the Lander Valley Community SRMA will be sustained or enhanced for nonmotorized recreationists to engage in horseback riding, hiking, trail running, and mountain biking, so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

**Activities:** Horseback riding, Trail running, Mountain biking, and Hiking.

**Experiences:** Enjoying having easy access to natural landscapes, Enjoying exercise and physical fitness, Enjoying closeness of friends and family, Enjoying having access to close to home outdoor amenities, and Feeling that this community is a special place to live.

**Benefits:** Improved mental and physical health, Greater connection to nature, Greater sense of place, Stronger ties with family and friends, Heightened sense of satisfaction with our community, and Reduced adverse human impacts such as litter, vegetative trampling, and unplanned trails.

#### RECREATION SETTING CHARACTERISTIC (RSC) DESCRIPTIONS

**Physical Characteristics:** Majority of the area is on or near improved country roads, but at least ½ mile from any highways. Natural setting may have subtle modifications that would be noticed but not draw the attention of the casual observer wandering through the area. Trails may exist but do not exceed standard and density to carry expected use. Facilities and structures are rare and isolated.

**Social Characteristics:** Usually 3-6 encounters per day off travel routes and 7-15 encounters per day on travel routes. Usually group size is small.

**Operational Characteristics:** Excluding county roads, adjacent housing development access roads, and livestock permittee access to range improvements; the area will be managed for nonmotorized use. Onsite controls and services are present, but harmonize with the natural environment.

#### MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

##### Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement closures to motorized vehicle use; utilize administrative access agreements to allow for the maintenance of range improvements.
- Mechanized use will be limited to designated roads and trails; these trails will be identified through the environmental assessment process in consideration of recommendations from partners such as the state land board, the grazing permittees, an established friends group or club, and other stakeholders or members of the public.
- Facility and trail development will focus on sufficient densities and developments to provide for a ¼ day (2-4 hours) of use.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Engage local sporting good businesses and other partners in the development and distribution of a brochure and/or area guide book.
- Some onsite visitor orientation (kiosk and trail markers) will be developed.
- This RMZ will be managed in a custodial fashion, until which time that a 'friends group' or local club demonstrates a willingness to be involved in the management and stewardship of the site.
- A memorandum of understanding (MOU) will be developed between the Bureau of Land Management (BLM) and pertinent partners such as the Wyoming State Land Board, livestock grazing permittees, local sporting good retailers, and an established friends group or club.
- The MOU will assign responsibility for the stewardship and development of the site and related amenities; the majority of cost and labor responsibilities associated with initial investments and maintenance of the identified trails and related amenities will be born upon the established friends group or club.
- The BLM and other partners will provide matching contributions when funding and labor pool allows.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols May-November.

##### Other Programs:

- No Surface Occupancy for Oil and Gas Development (alternatives A, B, and D)
- Closed to Geothermal Development (alternatives A, B, and D)

- Closed to Geophysical Exploration (alternatives A, B, and D)
- Closed To Material Sales and Free Use Permits (alternatives A, B, and D)
- New rights-of-ways are excluded (alternatives B and D)
- Co-locate new ROWs whenever possible (Alternative A)
- Renewable Energy Development is excluded (alternatives B and D)
- Petition to withdrawal from entry under the 1872 Mining Law (Alternative B)
- Mineral entry requires a Plan of Operations (alternatives A and D)
- Closed to motorized vehicle use (alternatives B and D)
- Motorized use limited to designated roads (alternatives A and C)
- Mechanized use limited to designated roads and trails (Alternative B)

#### IMPLEMENTATION DECISIONS

Implementation Decisions: (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## National Historic Trails Destination Special Recreation Management Area (Alternatives B and D)

**Table C.14. National Historic Trails Auto Tour Route Recreation Management Zone**

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate regional visitor demand for destination oriented Congressionally Designated Trail opportunities in a safe and facility rich environment; this demand has been identified by onsite customers, through community involvement workshops, visitor surveys, and through the enabling legislation of the National Historic Trails. The area contains four Congressionally Designated Trails including: Oregon, Mormon Pioneer, Pony Express, and California National Historic Trails. The area is currently used for intensive motorized oriented interpretation/wayside exhibits and therefore has the infrastructure and administrative support to accommodate this demand. SRMA management will maintain and enhance these amenities.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS
The Auto Tour Route RMZ will be sustained or enhanced for highway travelers to engage in historic site visitation/learning, teaching history, photography, and driving for pleasure so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:
<b>Activities:</b> Cultural site visitation, Learning cultural heritage, Teaching cultural heritage, Photography, and Driving for pleasure.
<b>Experiences:</b> Enjoying the closeness of friends and family, Learning more about the cultural heritage here, Having others nearby who could help you if needed, and Sharing Wyoming's cultural heritage with new people.
<b>Benefits:</b> Enjoying easy access to cultural and historic sites, Stronger ties with family and friends, Increased appreciation of the areas cultural history, Greater household awareness of and appreciation of our cultural heritage, Greater protection of area historic structures and archeological sites, and Sustainability of community's cultural heritage, Increased local tax revenue from visitors.
RECREATION SETTING CHARACTERISTIC DESCRIPTIONS
<b>Physical Characteristics:</b> Majority of the area is on or near primary highways, but still within a rural area. Natural setting may have modifications that range from being easily noticed to strongly dominant to observers. These alterations would remain visually subordinate from sensitive travel routes and use areas.
Paved, improved, and/or primitive roads/highways as well as nonmotorized trails dominate the landscape. Facilities and structures are readily apparent and may range from scattered to small dominant clusters.
<b>Social Characteristics:</b> People seem to be everywhere, but human contact remains intermittent.
<b>Operational Characteristics:</b> Ordinary highway auto and truck traffic is characteristic. Controls and services obvious and numerous. Largely harmonize with the man-made environment.
MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS



**Recreation and Visitor Services Program:**

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Work with partners and other agencies to continue maintenance of existing sites.
- Work with partner entities and the Wyoming State Historic Preservation Office to sustainably develop areas where new sites are needed to deliver targeted outcomes.
- The Bureau of Land Management (BLM) and partners will review (using the BLM's contrast rating system) existing facilities and interpretive exhibits to ensure designs harmonize with the characteristic landscape; designs out of character with the landscape will be modified so as not to overpower the landscape.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Utilize promotion to focus the majority of trail orientated users into this RMZ.
- Partner with education institution or local museum to develop an interpretive plan to ensure existing interpretation is accurate and delivers a consistent message.
- Coordinate with the National Park Service (NPS) to continue publishing "National Historic Trails Auto Tour Route Interpretive Guide Across Wyoming."
- Utilize promotion to tie this RMZ in with campground facilities in the Green Mountain Extensive Recreation Management Area; as well as available amenities in the Fremont County area.
- Ensure promotion of the area reaches interested user segments by piggyback marketing the RMZ with NPS marketing for Yellowstone National Park.
- Partner with National Historic Trails Center and other local museums to develop displays to demonstrate to potential visitors the opportunities that are available within the RMZ and similar management RMZs within the BLM Casper Field Office.
- The BLM will focus motorized trail orientated special recreation permits and trail interpretation in this RMZ.
- Additional administrative actions will be applied as needed to reduce unplanned visitor impacts (vandalism, social trails, litter etc.).
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies), monitor recreation setting condition through onsite patrols June-September.

**Other Programs:**

- The SRMA will be managed as a Class II Visual Resource.
- Additional Allowable Use Decisions for the National Historic and Scenic Trails are contained in Table 2.32, "7000 Special Designations (SD) – Congressionally Designated Trails" (p. 157).

**IMPLEMENTATION DECISIONS**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

**Table C.15. Group Use Recreation Management Zone**

<b>SUPPORTING INFORMATION</b>
This Special Recreation Management Area (SRMA) is necessary to accommodate regional visitor demand for destination oriented Congressionally Designated Trail reenactment opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers, through community involvement workshops, visitor surveys, and through the enabling legislation of the National Historic Trails. The area contains four Congressionally Designated Trails including: Oregon, Mormon Pioneer, Pony Express, and California National Historic Trails. The area is currently used for intensive nonmotorized reenactments and therefore has the infrastructure and administrative support to accommodate this demand. SRMA management will maintain and enhance these amenities.
<b>SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS</b>

The Group Reenactment RMZ of the National Historic Trails Destination SRMA will be sustained or enhanced for organized groups and other trail enthusiasts to engage in physically demanding cultural site visitation/learning, photography, and historic reenactments, so that participants in visitor assessments/surveys indicate a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:

**Activities:** Cultural site visitation, Learning cultural heritage, Teaching cultural heritage, Photography, and Historic reenactment.

**Experiences:** Develop personal and spiritual values, Reflect on personal values, Gaining an experience I can look back on, and Teach and learn about history here.

**Benefits:** Increased opportunities for youth, Greater spiritual growth, Greater appreciation of cultural histories, Increased understanding of history, Stronger ties with family and friends, Greater household awareness of and appreciation of our cultural heritage, Protection of cultural sites, Maintenance of distinctive historical recreation setting, and Reduced human impacts such as: litter, vegetation trampling, and unplanned trails.

#### RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

**Physical Characteristics:** The majority of this route is on or near 4-wheel drive roads, but at least ½ mile from all improved roads, though they may be in sight. Natural setting may have subtle modifications that would be noticed, but not draw the attention of an observer wandering through the area. Primitive motorized routes and nonmotorized trails may exist, facilities and structures are rare and often accessible via unimproved routes.

**Social Characteristics:** The average group size between July 1- August 15, should not exceed 100 people/group for three consecutive years. The average encounters with other groups per day between July 1- August 15, should not exceed 6 encounters per day for three consecutive years on the National Historic Trail.

**Operational Characteristics:** 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized use when the trail is on existing roads. Motorized vehicles are not allowed on Rocky Ridge. Vehicle use on the National Historic Trail in support of Special Recreation Permits will be limited. Onsite controls and services are low; primarily offsite. Minimum amount necessary to achieve planning objectives.

#### MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

##### Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Permanently close trail section over Rocky Ridge to motorized use.
- Motorized and mechanized travel in the remainder of the SRMA will be limited to existing roads and trails.
- The Bureau of Land Management (BLM) and partners (State Historic Preservation Office and National Park Service) will review (using the BLM's contrast rating system) interpretive exhibits to ensure designs harmonize with the characteristic landscape; designs out of character with the landscape will be modified so as not to overpower the landscape.
- Group use in the area is directed and managed through the 2005 Finding of No Significant Impact/Decision Record for Handcart Trekking.
- No competitive events will be authorized in this RMZ.
- Additional administrative actions will be applied as needed to reduce unplanned visitor impacts (vandalism, social trails, litter etc.).
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Utilize promotion to educate users on the physically demanding nature of this RMZ.
- Partner with education institution or local museum to develop an interpretive plan to ensure existing interpretation is accurate and delivers a consistent message.
- Review all interpretation to ensure all site-specific stories are told (Oregon Trail, Pony Express, etc.).
- Provide replacement/offsite interpretation opportunities for visitors physically unable to access motorized vehicle closure of Rocky Ridge, this site may be an interpretation panel or set of panels overlooking Rocky Ridge in close proximity to an improved motorized route.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies), monitor recreation setting condition through onsite patrols June-September.
- With stakeholder involvement, apply Limits of Acceptable Change (LAC) to ensure protection of the Historic Trail Resource. LAC focuses on a cycle of designing-implementing-monitoring-evaluating-adjusting actions to respond to future recreation issues and the results of monitoring.

**Other Programs:**

- The SRMA will be managed as a Class II Visual Resource.
- Additional Allowable Use Decisions for the National Historic and Scenic Trails are contained in Table 2.32, “7000 Special Designations (SD) – Congressionally Designated Trails” (p. 157).

**IMPLEMENTATION DECISIONS**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## Sweetwater Canyon Undeveloped Special Recreation Management Area (Alternatives B and D)

**Table C.16. Sweetwater Canyon Recreation Management Zone**

<b>SUPPORTING INFORMATION</b>
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for undeveloped/back country opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers and through community involvement workshops. The canyon waterway is a designated Wilderness Study Area (WSA) and considered for inclusion as a Wild and Scenic River. The area also provides spectacular scenic canyon walls, numerous wildlife species, high quality trout fishing, and opportunities for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
<b>SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS</b>
The Sweetwater Canyon Undeveloped SRMA will be sustained or enhanced for back country enthusiasts to engage in hiking, backpacking, fishing, horseback riding, hunting, and wildlife viewing so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes listed below:
<b>Activities:</b> Hiking/backpacking, Horseback riding, Hunting, Fishing, and Wildlife viewing.
<b>Experiences:</b> Enjoying the sensory experience of a natural landscape, Feeling good about solitude, Being isolated and independent, and Enjoying an escape from crowds of people.
<b>Benefits:</b> Enhanced awareness and understanding of nature, Improved appreciation of nature, Greater connection to nature, Improved opportunity to view wildlife close up, Better understanding of wildlife’s contribution to my quality of life, Greater sense of place, Reduced human impacts such as litter, vegetative trampling, and unplanned trails, Increased awareness and protection of natural landscapes, Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits, and Maintenance of community’s distinctive recreation tourism market.
<b>RECREATION SETTING CHARACTERISTIC DESCRIPTIONS</b>
<b>Physical Characteristics:</b> Implement motorized vehicle closures to enhance back country setting. Essentially an unmodified natural environment. Evidence of humans is unnoticed by an observer wandering through the area. Trails may exist but do not exceed standard to carry expected use. Facility and structures are extremely rare, and are located in disturbed (e.g., roaded or front country) areas.
<b>Social Characteristics:</b> Usually 3-6 encounters per day off travel routes (e.g., campsites) and 7-15 encounters per day on travel routes. Usual group size is small.
<b>Operational Characteristics:</b> Access to this area utilizes existing routes available for 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized routes. A large portion of this area (WSA and inaccessible portions) do not allow for any motorized or mechanized use. Onsite controls and services are low; primarily offsite. Minimum amount necessary to achieve planning objectives.
<b>MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS</b>

**Recreation and Visitor Services Program:**

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement closures within the WSA to motorized and mechanized vehicles.
- Motorized and mechanized travel outside of the WSAs will be limited to designated roads and trails; these roads and trails will be identified through this Resource Management Plan as an implementation action.
- The WSA will be closed to organized group and competitive event Special Recreation Permits.
- Other Special Recreation Permits will be limited as necessary to reach and maintain desired future setting condition
- A foot/horseback trail may eventually need to be developed or identified (from existing trails within the area) to ensure resource protection. Additional trails may also be added to connect the main trail to additionally identified access points.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Engage local sporting good businesses and other partners to ensure promotional material does not over advertise the area.
- Some onsite visitor orientation (kiosk and signs) may be developed.
- Consider the use of a memorandum of understanding or other cooperative agreement between the Bureau of Land Management and pertinent partners to maintain and enhance this areas unique natural setting.
- Work with the Wyoming Game and Fish Department and other interested entities to maintain and enhance terrestrial and aquatic habitat in the area.
- Solicit partnerships to ensure adequate maintenance of the areas signs and fences.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).
- Monitor recreation setting condition through onsite patrols.

**Other Programs:**

- The WSA is managed under the Interim Management Policy for Lands Under Wilderness Review
- The WSA is managed as a Class I Visual Resource (all alternatives)
- Closed to Livestock Grazing (Alternative B)
- Closed to Motorized and Mechanized Travel (Alternative B)

**IMPLEMENTATION DECISIONS**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## Sweetwater Rocks Undeveloped Special Recreation Management Area (Alternatives B and D)

**Table C.17. Sweetwater Rocks Recreation Management Zone**

SUPPORTING INFORMATION
This Special Recreation Management Area (SRMA) is necessary to accommodate local visitor demand for undeveloped/back country opportunities in semi-arid sagebrush step regions; this demand has been identified by onsite customers and through community involvement workshops. The Sweetwater Rocks contain 4 designated Wilderness Study Area (WSA). The area also provides spectacular scenic granite formations, numerous wildlife species, high quality climbing, and opportunities for solitude. SRMA management will sustain and enhance these amenities as well as accommodate the visitor demand.
SRMA/RECREATION MANAGEMENT ZONE (RMZ) OBJECTIVE(S) DECISIONS

The Sweetwater Rocks Undeveloped SRMA will be sustained or enhanced for back country enthusiasts to engage in hiking, backpacking, climbing, horseback riding, hunting, and wildlife viewing, so that participants in visitor assessments/surveys report a higher than average (mean average of 4.0 on a 5 point scale) realization of experience and benefit outcomes below:

**Activities:** Climbing, Hiking/backpacking, Horseback riding, Hunting, and Wildlife viewing.

**Experiences:** Developing skills and abilities, Enjoying having access to hands on environmental learning, Enjoying the sensory experience of a natural landscape, Feeling good about solitude, being isolated and independent, and Enjoying teaching others about the outdoors.

**Benefits:** Improved leadership abilities, Improved outdoor knowledge and self confidence, Enhanced awareness and understanding of nature, Improved appreciation of nature, Greater connection to nature, Improved opportunity to view wildlife close up, Greater respect for private property and local lifestyles, Greater sense of place, Improved outdoor recreation skills, Reduced human impacts such as litter, vegetative trampling, and unplanned trails, Improved respect for privately owned lands, Increased awareness and protection of natural landscapes, Enhanced ability for visitors and residents to find areas providing desired recreation experiences and benefits, Maintenance of community's distinctive recreation tourism market, and Greater value added service industry.

#### RECREATION SETTING CHARACTERISTIC DESCRIPTIONS

**Physical Characteristics:** Implement motorized vehicle closures to enhance back country setting. Essentially an unmodified natural environment. Evidence of humans is unnoticed by an observer wandering through the area. Trails may exist but do not exceed standard to carry expected use. Facility and structures are extremely rare, and are located in disturbed (e.g., roaded or front country) areas.

**Social Characteristics:** Usually 3-6 encounters per day off travel routes (e.g., campsites) and 7-15 encounters per day on travel routes. Usual group size is small.

**Operational Characteristics:** Access to this area utilizes existing routes available for 4-wheel drive vehicles, all-terrain vehicles, dirt bikes, or over-snow vehicles in addition to nonmotorized mechanized routes. A large portion of this area (WSAs and inaccessible portions) do not allow for any mechanized use. Onsite controls and services are low; primarily offsite. Minimum amount necessary to achieve planning objectives.

#### MANAGEMENT ACTIONS AND ALLOWABLE USE DECISIONS

##### Recreation and Visitor Services Program:

- Utilize adaptive management techniques to provide identified recreation opportunities (activities, experiences, and benefits) and reach desired future setting conditions.
- Implement closures within the WSA to motorized and mechanized vehicles (Alternative B), utilize administrative access agreements to allow for the maintenance of range improvements. Motorized and mechanized travel outside of the WSAs will be limited to designated roads and trails; these roads and trails will be identified through this Resource Management Plan.
- The Bureau of Land Management (BLM) will work with local landowners, the Access Fund, Friends of Sweetwater Rocks, local sporting goods retailers, and the National Outdoor Leadership School to pursue land trades, acquisitions or easement in and around this RMZ to facilitate better nonmotorized access.
- Partners will also emphasized the importance of: getting landowner permission before crossing any and all private lands, abiding by Wyoming State land restrictions on overnight camping, and increasing understanding of land ownership patterns in the area.
- Ensure targeted experiences and benefits as well as recreation setting information is included and explained in all visitor information.
- Engage local sporting good businesses and other partners to ensure promotional material does not over advertise the area.
- Some onsite visitor orientation (kiosk and signs) may be developed.
- A memorandum of understanding (MOU) will be developed between the BLM and willing/pertinent partners such livestock grazing permittees, local sporting good retailers, the friends of Sweetwater Rocks, the National Outdoor Leadership School, the Wyoming State Land Board, the Access Fund, the Nature Conservancy, and private landowners.
- The MOU will emphasize the desires to maintain this areas unique natural setting while also ensuring protection of private property rights. The BLM will work cooperatively with all partners to pursue improved nonmotorized access.
- Solicit partnerships and cooperative agreements to: monitor outcome attainment and preferences through customer assessments (focus group interviews or visitor studies).

- Monitor recreation setting condition through onsite patrols.

**Other Programs:**

- All WSAs are managed consistent with the Interim Management Policy for Lands Under Wilderness Review
- Manage as a Class 1 Visual Resource
- Closed to motorized and mechanized vehicles in the WSA (Alternative B)
- Detailed management of the area outside of the WSA is detailed in Table 2.31, “6000 Land Resources (LR) – Recreation” (p. 144).

**IMPLEMENTATION DECISIONS**

**Implementation Decisions:** (e.g., the land use plan decision may be to designate overnight camping areas while the supporting implementation decisions would address specific site locations, size, and amenities to be provided.)

## Appendix D. Reclamation Objectives and Standards

Reclamation will be required for any surface-disturbing activity occurring on public lands. A reclamation plan appropriate in detail and complexity and tailored to a specific surface-disturbing activity will be required for this activity. This appendix details the reclamation objectives and standards necessary to achieve a timely and proper recovery according to management objects of the disturbed site and is consistent with the Wyoming Reclamation Policy.

The reclamation plan will provide comprehensive as well as detailed site-specific reclamation procedures, methods and actions to successfully meet the objectives and standards for any surface disturbance. The reclamation plan will also include sufficient monitoring requirements and reports to ensure reclamation success has been accomplished. Site-specific reclamation plans will identify the dominant Ecological Site Description, referenced plant communities, and soil map unit. The approved reclamation plan must adhere to federal, state and local requirements, which can be used by regulatory agencies in their oversight roles to ensure that the reclamation measures are implemented, are appropriate for the site, and are environmentally sound.

Low Reclamation Potential (LRP) areas as identified in the LRP Map (Map 11) will require site-specific measures in the reclamation plan and will address the critical characteristics associated with these sites. These critical characteristics include but are not limited to soil erosivity, chemical and physical soil restrictive characteristics, steep slopes, and inadequate affective precipitation.

Project level reclamation objectives and standards will be established prior to disturbance and must be consistent with the objective set forth. The objectives and standards may be modified by the Authorized Officer if site-specific situations are deemed necessary to meet the overall land management objectives. Reclamation objectives are as follows:

- The objective of interim reclamation in the Designated Development Areas (DDAs) is to rehabilitate disturbed sites during the interim phase of development to achieve landscape continuity, minimize invasive nonnative species (INNS) and stabilize the soil. Interim reclamation will utilize mostly native plant species and will be designed to minimize re-disturbance during final reclamation activities and to initiate and accelerate ecological succession.
- The objective of interim reclamation in non-DDAs is to rehabilitate disturbed sites during the interim phase of development to achieve landscape continuity, minimize INNS and stabilize the soil and to promote a diversified plant community with the end result of accelerating the vegetative process to meet wildlife habitat goals. Interim reclamation will utilize mostly native plant species and will be designed to minimize re-disturbance during final reclamation activities and to initiate and accelerate ecological succession.
- The objective of final reclamation in DDAs is to rehabilitate disturbed sites to achieve landscape continuity minimize INNS, and provide for a stabilized ecologically diverse plant community. Final reclamation is successful when a state of ecological progressive succession is achieved which can eventually advance to full ecosystem restoration.
- The objective of final reclamation in the non-DDAs is to reclaim disturbed sites to achieve landscape continuity, minimize INNS, and provide for a stabilized ecologically diverse plant

*Appendix D Reclamation Objectives and Standards  
Sweetwater Rocks Undeveloped Special Recreation  
Management Area (Alternatives B and D)*

community, which will support approximately the same composition and density of organisms that were originally present. Final reclamation is successful when a state of ecological progressive succession is achieved which can eventually advance to full ecosystem restoration.

<b>Interim Reclamation Standards for Designated Development Areas</b> Reclamation will be considered successful 3 years after seeding if the following criteria are met:	
<b>Site Characteristics</b>	<b>Standards</b>
Percent Ground Cover	80 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	<ul style="list-style-type: none"> <li>• At least 65 percent total plant species must be from major grasses, forbs and/or shrubs listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seeding mix</li> <li>• No greater than 15 percent INNS and 35 percent INNS in a 500 square foot area</li> <li>• No invasive plant species present</li> </ul>
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: <ul style="list-style-type: none"> <li>• Soil Surface Structure and Soil Organic Matter content</li> <li>• Average Percent of Litter Cover and Depth</li> <li>• Expected Annual Production</li> <li>• Functional/Structural Groups</li> </ul>
BLM Bureau of Land Management NRCS Natural Resources Conservation Service INNS Invasive nonnative species	

<b>Interim Reclamation Standards for non-Designated Development Areas</b> Reclamation will be considered successful 5 years after seeding if the following criteria are met:	
<b>Site Characteristics</b>	<b>Standards</b>
Percent Ground Cover	At least 90 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	<ul style="list-style-type: none"> <li>• At least 75 percent total plant species must be from major grasses, forbs and shrubs listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seed mix</li> <li>• At least 5 percent of the total plant species must be woody plants as listed in the Ecological Site Desired Plant Community</li> <li>• At least 5 percent of the total plant species must be forbs as listed in the Ecological Site Desired Plant Community</li> <li>• No greater than 15 percent INNS and 35 percent INNS in a 500 square foot area</li> <li>• No invasive plant species present</li> </ul>
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: <ul style="list-style-type: none"> <li>• Soil Surface Structure and Soil Organic Matter content</li> <li>• Average Percent of Litter Cover and Depth</li> <li>• Expected Annual Production</li> <li>• Functional/Structural Groups</li> </ul>
BLM Bureau of Land Management NRCS Natural Resources Conservation Service INNS Invasive nonnative species	



<b>Final Reclamation Standards for Designated Development Areas</b>	
Reclamation will be considered successful after receipt of project abandonment if the following criteria are met:	
<b>Site Characteristics</b>	<b>Standards</b>
Percent Ground Cover	90 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	<ul style="list-style-type: none"> <li>• At least 80 percent total plant species must be from major grasses, forbs and/or shrubs listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seeding mix</li> <li>• At least 5 percent of the total plant species must be woody plants as listed in the Ecological Site Desired Plant Community</li> <li>• At least 5 percent of the total plant species must be forbs as listed in the Ecological Site Desired Plant Community</li> <li>• No greater than 10 percent INNS and 25 percent INNS in a 500 square foot area</li> <li>• No invasive plant species present</li> </ul>
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: <ul style="list-style-type: none"> <li>• Soil Surface Structure and Soil Organic Matter content</li> <li>• Average Percent of Litter Cover and Depth</li> <li>• Expected Annual Production</li> <li>• Functional/Structural Groups</li> </ul>
BLM Bureau of Land Management NRCS Natural Resources Conservation Service INNS Invasive nonnative species	

<b>Final Reclamation Standards for non-Designated Development Areas</b>	
Reclamation will be considered successful after receipt of project abandonment if the following criteria are met:	
<b>Site Characteristics</b>	<b>Standards</b>
Percent Ground Cover	100 percent of the Erosion indicator as listed on NRCS Reference Sheet for Ecological Site is met
Plant Species Composition (by weight)	<ul style="list-style-type: none"> <li>• At least 85 percent of total plant species must be from dominate grasses, forbs and woody plants listed in the Ecological Site Desired Plant Community and/or BLM authorized plant species from seed mix</li> <li>• All major grasses must be present</li> <li>• Major woody plant species will meet minimum percentage and/or total woody plants present will meet minimum percentage of growth form characteristics listed in the Ecological Site Desired Plant Community.</li> <li>• At least 3 of the listed forb must be present and at least 5 percent of the total plant species must be forbs as listed in the Ecological Site Desired Plant Community</li> <li>• No greater than 5 percent INNS and 15 percent INNS in a 500 square foot area</li> <li>• No invasive plant species present</li> </ul>
Site Stability, Erosion Potential, and other Variables	Meet NRCS Reference Sheet Indicators for Ecological Site with the following exceptions: <ul style="list-style-type: none"> <li>• Soil Surface Structure and Soil Organic Matter content</li> <li>• Average Percent of Litter Cover and Depth</li> <li>• Expected Annual Production</li> <li>• Functional/Structural Groups</li> </ul>
BLM Bureau of Land Management NRCS Natural Resources Conservation Service INNS Invasive nonnative species	

Monitoring of reclaimed areas will be required and will ensure reclamation standards have been met. Reclaimed areas will be monitored annually by project proponent or BLM personnel if designated in the reclamation plan. Reclamation monitoring protocol will be included in the reclamation plan as approved by BLM.

Reclamation monitoring will be documented in an annual reclamation report submitted to the Authorized Officer by December 31 of each year after one full growing season following seeding. The report will document all aspects of the following:

- The 10 requirements of the Wyoming Reclamation Plan;
- The requirements of the Resource Management Plan reclamation objectives and standards;
- Requirements of the Onshore Oil and Gas Orders;
- Identify whether the reclamation objectives and standards are likely to be achieved in the near future without additional actions; and
- Identify actions that have been or will be taken to meet the objectives and standards.

The report will also include acreage figures for the following:

- Initial disturbed acres;
- Successful Interim Reclaimed Acres; and/or
- Successful Final Reclaimed Acres.

Annual reports will not be submitted for approval by the Authorized Officer as having fully met interim or final reclamation standards. Any time 15 percent or more of a reclaimed area is re-disturbed, monitoring will be reinitiated. Actions will be taken to ensure that reclamation standards are met as quickly as reasonably practical. The Authorized Officer will be notified in a separate document by the project proponent when the reclamation operations have been completed that indicate the site meets reclamation standards and is ready for final inspection.

# Appendix E. Exception, Modification, and Waiver Criteria

## E.1. Introduction

This appendix addresses the procedure for providing exceptions, modifications, and waivers of stipulations or Conditions of Approval (COAs) placed on oil and gas leases and other surface disturbance and disruptive activity authorizations to protect resource values identified in Chapter 3. These values generally include wildlife, soil, water, recreation, visual, and cultural resources. The Bureau of Land Management (BLM) may apply stipulations or COAs identified in the Standard Oil and Gas Stipulations (Appendix N (p. 1495)) and the Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities (Appendix M (p. 1489)). The three types of surface stipulations the BLM applies are: 1) no surface occupancy (NSO), 2) timing limitation stipulation (TLS), and 3) controlled surface use (CSU). The surface stipulations are defined below.

- **No Surface Occupancy:** Areas closed to placement of surface facilities such as roads, oil and gas wells, and other facilities. This stipulation may be applied to oil and gas leases only before a lease is issued.
- **Timing Limitation Stipulation:** Areas closed to construction and development activities during identified timeframes. The alternatives vary in the application of TLSs to maintenance activities, including associated vehicle travel, during the closed period unless otherwise specified in the stipulation.
- **Controlled Surface Use:** Areas where surface uses are subject to specified controls or constraints.

The BLM cannot apply an NSO stipulation after oil and gas lease issuance, but can apply TLS and CSU restrictions as COAs after the oil and gas lease has been issued.

An applicant can request an exception, modification, or waiver of a NSO, TLS, or CSU stipulation or a COA. This document identifies the criteria that the BLM would utilize in making the determination to except, modify, or waive the stipulation or COA. The Resource Management Plan (RMP) serves as the vehicle for providing analysis of the conditions under which waivers, exceptions, or modifications of lease stipulations or COAs may be granted.

A request for exception must be initiated in writing before the time that the work was originally proposed to conclude. The unpredictability of weather, animal movement and condition, etc., precludes analysis of requests related to wildlife far in advance of the time periods in question. However, where possible, the applicant should seek the exception at least two-weeks in advance. Analyses of a request include review of potential mitigation measures and alternatives (e.g., traffic restrictions, alternative scheduling, and staged activity). The request is considered as a unique action and is analyzed and documented individually for RMP and National Environmental Policy Act (NEPA) compliance.

Exception requests will not be granted for stipulations or operating standards designed to protect threatened and endangered species, unless the BLM consults with the U.S. Fish and Wildlife Service (USFWS) and reinitiates consultation, if appropriate.

## E.2. Exceptions, Modifications, and Waivers

An applicant may request an exception, modification, or waiver of a stipulation or restriction included in a lease or applied as a COA, as defined below.

- **Exception:** A one-time exemption to a lease stipulation or COA determined on a case-by-case basis.
- **Modification:** A change to the provisions of a lease stipulation, either temporarily or for the term of the lease.
- **Waiver:** A permanent exemption to a lease stipulation.

The person requesting the exception, modification, or waiver is encouraged to submit information that might assist the authorized official in making a decision. The Authorized Officer reviews information submitted in support of the request and other pertinent information. The Authorized Officer may modify, waive, or grant an exception to a stipulation if:

- The action is consistent with federal laws.
- The action is consistent with the RMP.
- The management objectives that led the BLM to require the lease stipulation can be met without restricting operations in the manner provided for by the stipulation given changes in the condition.
- The action and the impacts that would result are acceptable to the Authorized Officer based on a review of the environmental consequences.

## E.3. Standard Exception

An exception may be granted by the Authorized Officer if it can be demonstrated that the ground-disturbing activity/lease stipulation would not cause adverse impacts to the targeted resource, condition, or public interest as defined by RMP objectives, standards, or conditions and:

1. is intended to improve the targeted resource, condition, or public interest (e.g., vegetation treatment in a NSO area to improve wildlife habitat, trail construction in a NSO/CSU area for a Special Recreation Management Area (SRMA) to improve recreational opportunities), or
2. the ground-disturbing activity (mentioned above), by its nature, must be done within the targeted NSO/CSU area (e.g., spring development within a NSO area for riparian-wetland vegetation, installation of brook trout stream barrier in a NSO area for cutthroat trout, or short duration road maintenance).

In situations where a ground-disturbing activity/lease stipulation is excepted, the activity could be subject to additional COAs, reclamation measures, or best management practices. Measures applied will be based on the nature, extent, and values potentially affected by the ground-disturbing activity. Excepted ground-disturbing activities/lease stipulations are given on a one-time case-by-case basis and would not necessarily constitute subsequent approvals.

## E.4. Resource Specific Exceptions

### E.4.1. Wildlife

Activities within the planning area are managed with stipulations or COAs to protect important times of the year and habitats for wildlife. A NSO or CSU stipulation may be placed on oil and gas leases to protect greater sage-grouse breeding areas or habitat for other special status species from surface-disturbing activities. TLSs or COAs may be used to protect wintering or birthing big game, nesting greater sage-grouse, raptor, mountain plovers, or spawning trout. Application of TLSs to maintenance and operation of a developed project varies by alternative. Protective wildlife seasonal restrictions are developed consistent with statewide dates and in coordination with the Wyoming Game and Fish Department (WGFD) and/or the USFWS.

The BLM may grant exceptions to seasonal restrictions if the BLM determines that granting an exception would not jeopardize the wildlife population being protected. The BLM uses a set of factors when considering a request for an exception. The professional judgment of the BLM and the wildlife agencies play a key part in the BLM's decisions on whether to grant exceptions. No clear-cut formula exists.

The following section describes some of the factors considered by the BLM when determining whether a request for an exception to wildlife seasonal stipulations or COAs should be granted.

1. Resource Concern
  - Animal presence or absence
  - Additional or new resource concerns
  - Potential for increased wildlife accidents or poaching
2. Animal Conditions
  - Physical condition of individual animals (e.g., fat reserves)
  - Local animal population condition (animal density)
  - Potential for additive mortality
  - Likelihood of introduction or increased incidence of disease
  - Likelihood of decreased recruitment/natality
3. Climate/Weather
  - Snow conditions (depth, crusting, and longevity)
  - Current and historic local precipitation patterns
  - Current and historical seasonal weather patterns
  - Recent and current wind-chill factors (indication of animals' energy use)
  - Duration of condition
  - Short- and long-range forecasts
4. Habitat Condition and Availability
  - Water and forage condition (availability, quality, and quantity)
  - Competition (interspecific, intraspecific)
  - Animal use of available forage
  - Suitable and ample forage immediately available and accessible
5. Spatial Considerations
  - Migration/travel corridors

- Winter range, foraging, parturition or breeding
- Topography (plains vs. mountains)
- Topographic/geographic limitations (barriers)
- Presence of thermal cover (e.g., protection from wind)
- Proportion of range impacted
- Juxtaposition and density of other activities/disturbances in the vicinity
- Cumulative impacts

6. Timing

- When proposed activity would occur in the stipulation period
- Kind and duration of potentially disruptive activity
- Likelihood of animals habituating to the proposed activity

## **E.4.2. Cultural Resources**

The areas around and including special Sacred, Spiritual and/or Traditional Cultural Properties such as Castle Gardens (called “restriction zones”) are managed with surface occupancy and disturbance stipulations which vary by alternative. The BLM may grant exceptions to these stipulations subject to Standard Protocol and National Historic Preservation Act (NHPA) measures. The BLM would consult with affected tribes to ascertain their opinion on the proposal. The BLM would follow the tribes’ opinion regarding restriction zone activities in all but the most extraordinary circumstances.

## **E.4.3. Oil and Gas Actions**

Title 43 CFR 3101.1-4 establishes procedures for granting modifications or waivers to oil and gas lease stipulations, as stated below:

A stipulation included in an oil and gas lease shall be subject to modification or waiver only if the authorized officer determines that the factors leading to its inclusion in the lease have changed sufficiently to make the protection provided by the stipulation no longer justified or if proposed operations would not cause unacceptable impacts. If the Authorized Officer has determined, prior to lease issuance, that a stipulation involves an issue of major concern to the public, modification or waiver of the stipulation shall be subject to public review for at least a 30-day period. In such cases, the stipulation shall indicate that public review is required before modification or waiver. If subsequent to lease issuance the Authorized Officer determines that a modification or waiver of a lease term or stipulation is substantial, the modification or waiver shall be subject to public review for at least a 30-day period.

The modification or waiver of an oil and gas lease stipulation implies that the sensitive resource for which the protective measure was considered is in some way not present in the area or in some way no longer in need of the protective measure. In either case, consideration of a modification or waiver of a lease stipulation would require environmental analysis and may result in an amendment to the land use plan.

## E.5. Procedures for Exceptions

Requests for exceptions may, in general, be made at any time. In the case of seasonal restrictions for the benefit of wildlife, the request should be made within 2 weeks of conducting the proposed work. The unpredictability of weather, animal movement and condition, precludes analysis of requests related to wildlife concerns far in advance of the time periods in question. The request is considered as a unique action and is analyzed and documented individually for RMP and NEPA compliance. The request must include the following information:

**WHY** the public land user needs the exception. Include the reason(s) why the action could not be completed within the original stipulation period, any evidence of why the action would not adversely affect the resource or species being protected, or any other information (additional mitigation measures or alternatives) that would help the BLM (and WGFD or USFWS) in reviewing the request.

**WHO** is filing the exception request. This must include the company name, the name of the contact person, and the address, telephone number, e-mail address (if available), and fax number of the contact person.

**WHAT** is being requested. This must include a detailed description of the activity including types of equipment or vehicles required and the number of trips expected. Please include the name and/or number of the authorization (i.e. application for permit to drill, sundry, right-of-way) and the affected stipulation/restriction.

**WHERE** the activity would take place. This must include the legal description of the activity, the location of the access roads and pipelines, and a map clearly depicting these areas. Proponent prepared GIS layers meeting BLM requirements will expedite the processing.

**WHEN** the activity would occur. This must include the start date, end date, and time of day/night when activities would occur.

Requests must be made in writing and hard copy delivered to the Lander Field Manager at the physical address of the office. When time is of the essence, the process may be initiated by fax or electronic delivery of a scanned copy but the original must be received by the Lander Field Office within 3 working days. No exception, waiver, or modification will be issued until the hard copy request is received.

BLM may consider verbal requests for and grant verbal approvals of exceptions in Designated Development Areas. However, the operator must submit a written notice within 7 days after the verbal request. A verbal request is considered a unique action and should be used only if serious economic or public health and safety problems could result from denial of the request.

Exceptions will not be granted for stipulations or COAs resulting from Section 7 consultation regarding the Endangered Species Act with the USFWS for listed species unless a biological assessment (BA) is completed and reinitiation of Section 7 consultation occurs. This process, depending on the potential impacts and whether incidental take is involved, typically requires 3 to 6 months for completion. The operator or lease holder is responsible for the BA, which must be satisfactorily completed in accordance with the requirements of the BLM.

# Appendix F. Lander Air Resources Management Plan

## F.1. Purpose

The purpose of this air resources management plan is to address air quality issues identified by the Bureau of Land Management (BLM) in its analysis of potential impacts to air quality resources for the Lander Field Office Resource Management Plan (RMP). This plan outlines the specific requirements for managing air resources and authorizing activities that have the potential to adversely impact air resources within the Lander Field Office planning area. The plan also outlines specific requirements for proponents of projects that have the potential to generate air emissions and adversely impact air resources within the planning area.

## F.2. Air Quality Issues

The BLM based its identification of air quality issues on the following information:

- The air emissions inventory compiled for the planning area which estimated potential emissions of air pollutants for maximum allowable development and authorizations under each alternative
- Existing air monitoring data from the South Pass and Lander State and Local Monitoring Site (SLAMS) stations, the South Pass and Sinks Canyon National Atmospheric Deposition Program (NADP) sites, and the Bridger and North Absaroka Interagency Monitoring of Protected Visual Environments (IMPROVE) sites.
- The Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas (BLM 2009d), Mineral Occurrence and Development Potential Report (BLM 2009c), and potential levels and location of development identified in Chapter 4 of the RMP.

### F.2.1. Magnitude of Emissions

An air emissions inventory was compiled for the planning area to determine the relative magnitude of total air pollutant emissions and to compare emissions between alternatives. Emissions were calculated using conservative assumptions about the likelihood of potential activities occurring under each alternative that result in maximum air emissions being estimated. For example, air emissions from oil and gas activities assume that all of the potential development identified in the RFD will occur. The RFD is based upon known geologic conditions, current development technology, and industry-provided data about future planned development. Future pricing and economic or technical viability of geologic plays were not taken into account. Air emissions from non-oil and gas mineral development, such as uranium mining, were calculated assuming maximum development scenarios even though these activities are vulnerable to economic variability. Assumptions regarding the use of air emission control technologies were also very conservative. For example, air emissions from drilling activities assume a mixture of Tier 1 – Tier 3 diesel engines. However, it is likely that significant improvement in emissions could be realized over the life of the plan through the use of alternative drilling technologies.

As a result, the compiled air emissions inventory represents the emissions of air pollutants based on best available but very speculative information for future development projections. It is very likely that the emissions inventory over-estimates projected future emissions due to the



conservative assumptions used. However, it is valid for contrasting the impact of management actions and strategies on air resources among alternatives. It is also useful for identifying those activities that are likely to be major contributors to increased air emissions and developing management actions to minimize their impact to air resources.

Despite the limitations of the air emissions inventory it supports two major conclusions:

1. there is not a substantial difference in total air emissions among alternatives (Table 4.1, “Estimated Annual Emissions Summary for BLM Activities in the Lander Planning Area” (p. 540)), and
2. for the management activities analyzed, oil and gas development activities are the major contributor to total air emissions and non-oil and gas mineral development activities (mining) are the major contributor to particulate matter emissions.

The reason there is not a substantial difference in total air emissions among alternatives is the result of several factors:

- The oil and gas development in the planning area is primarily in tightly-focused discrete areas that have relatively few conflicts with other resource uses. The constraints placed on oil and gas development under all alternatives to protect other resources do not vary greatly, therefore, the projected emissions do not vary greatly.
- Under Alternative B, the most restrictive alternative, a substantial portion of the oil and gas RFD is assumed to be developed.
- Under all alternatives, existing sources of emissions are assumed to continue to comprise a substantial portion of total projected emissions.

While the BLM has discretion to make allocative decisions in these areas under any alternative, due to the high percentage of existing leases in areas with potential oil and gas development (approximately 93 percent) the ability to implement substantial restrictions on development is primarily limited to mitigation measures that can be applied during project approval. Such restrictions include cooperative development of project-specific measures to minimize impacts to air resources as outlined in this plan.

## **F.2.2. Pollutants of Concern**

Air monitoring data from the South Pass SLAMs monitor located on the south western edge of the planning area measured ozone concentrations above the National Ambient Air Quality Standards (NAAQS) during the 2008-2010 time period. Seven exceedances of the 8-hour ozone standard above 75 parts per billion (ppb) were recorded in 2009 while one hour values at or above 75 ppb were recorded twice in 2008 and once in 2010. The South Pass monitor was the only monitor measuring ozone within the planning area during the 2008-2010 period. It is difficult to determine if ozone concentrations above the NAAQS are occurring throughout the planning area or if the high concentrations are unique to the South Pass area because of its proximity to and downwind location from the Upper Green River Valley (a proposed ozone non-attainment area). The emissions inventory compiled for each alternative shows that estimated emissions from BLM authorized activities such as oil and gas development have the potential to cause or contribute to increased levels of ozone which may result in exceedances of the ozone standard due to increased emissions of ozone forming precursors. Therefore, the BLM has identified ozone and the precursors, nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs), as pollutants of concern to be addressed through specific management actions described in this plan.

Air monitoring data from the residential SLAMs monitor located in the town of Lander shows that the 98th percentile of 24-hour average concentrations for particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>) averaged over the three year period 2008-2010 is approximately 30 micrograms per cubic meter (ug/m<sup>3</sup>) or 87 percent of the NAAQS. However, the annual average of PM<sub>2.5</sub> concentrations at the same site over the same time period is approximately 8.4 ug/m<sup>3</sup> or 56 percent of the NAAQS. It is likely that the short term high concentrations in PM<sub>2.5</sub> are due to wintertime woodstove use and natural events such as wildfires or high wind events having a localized impact in the town of Lander. It is difficult to fully support this conclusion due to a lack of PM<sub>2.5</sub> monitoring data in the planning area. The emissions inventory compiled for each alternative shows that estimated emissions from BLM authorized activities such as mining and vegetation management through prescribed fire may have the potential to cause or contribute to short term localized increases in levels of PM<sub>2.5</sub>. Therefore, BLM has identified PM<sub>2.5</sub> as a pollutant of concern to be addressed through specific management actions described in this plan.

Representative air monitoring data for hazardous air pollutants (HAPs) is not available for the planning area, however increases in estimated emissions of a subset of these pollutants was shown through the compilation of the emissions inventory for each alternative. Specifically, emissions of benzene, toluene, ethyl benzene, xylenes, n-hexane, and formaldehyde were estimated to increase due primarily to development of oil and gas resources. Emissions of these pollutants from leaks, venting, internal combustion, and flaring associated with BLM authorized oil and gas development have the potential to result in short term, near-field increases in concentrations of these pollutants. Therefore, BLM has identified this subset of HAPs as pollutants of concern to be addressed through specific management actions described in this plan.

### **F.2.3. Air Emission Generating Activities**

Air emissions were estimated for 11 different categories of activities that BLM authorizes, allows, or performs and that have the potential to emit regulated air pollutants. The estimated emissions, based on the maximum development potential under each alternative were used to identify activities that have the potential to contribute to increases in concentrations of regulated air pollutants and to determine those activities that warrant specific management strategies for minimizing air quality impacts.

Under each alternative, oil and gas development activities were identified as the major contributor to increases in emissions of NO<sub>x</sub>, VOC, and HAPs. Non-oil and gas mineral development activities, specifically sand and gravel mining and processing, and other solid minerals mining were identified as the major contributor to increases in particulate matter emissions.

### **F.2.4. Geographic Areas of High Potential for Development**

The Mineral Occurrence and Development Potential Report and the RFD Scenario for Oil and Gas identified geographic areas of high, moderate, and low development potential for conventional oil and gas, coalbed natural gas (CBNG), and locatable and salable minerals.

One area was identified within the planning area as high potential for conventional oil and gas development and is located in the northeast corner of the planning area surrounding the town of Lysite. This area is comprised of the existing and proposed expansion of the Gun Barrel, Madden Deep, Ironhorse oil and gas development units. Areas of moderate potential for oil and gas development have been identified in the central portion of the planning area

surrounding the Beavercreek unit and in the southern portion of the planning area overlapping the Fremont-Sweetwater county border (Map 17). Moderate potential for CBNG development has been identified in these same two areas (Map 20).

Under the Preferred Alternative, the Lander Field Office identified Designated Development Areas (Map 134) based on locations of high and moderate potential oil and gas development and a need to protect other resources. The intention of these Designated Development Areas is to maximize potential oil and gas development in defined locations while minimizing impacts to other natural resources across the planning area. The locations of these Designated Development Areas provide the following benefits to air resources:

- Encourages future oil and gas development in areas of existing development thereby reducing impacts to air from new construction, new production facilities, and new compression sources that would be required in undeveloped fields,
- Encourages future oil and gas development in areas located downwind of and over 50 kilometers (31 miles) from the nearest federally designated Class I area,
- Downwind impacts from the Designated Development Areas are not likely to impact Class I or sensitive Class II areas, major population centers, or areas with ambient air concentration levels of concern,
- Encourages future oil and gas development in geographic areas of relatively flat terrain with minor shallow basins and relatively consistent west-southwesterly winds thereby minimizing potential for stagnation and cold pooling that can lead to increased ozone formation,
- Encourages future oil and gas development in areas a considerable distance from major population centers,
- Excludes oil and gas development in the Dubois area, an area of air quality sensitivity due to its proximity to federally designated Class I and identified sensitive Class II areas.

Geographic areas of high, moderate, and low potential for locatable minerals (specifically uranium, phosphate, bentonite, and gold) and salable minerals (specifically sand and gravel) were identified within the planning area. The Lander Field office has also identified specific areas that would be closed to mineral materials disposal (Map 37), and locatable mineral withdrawals (Map 24) within each of the alternatives. When these restrictions are considered in concert with the geologic locations of non-oil and gas minerals, likely locations for non-oil and gas minerals development are constrained to areas located primarily in the central and southern portions of the planning area. These potential areas of development are located in geographic areas of relatively flat terrain with minor shallow basins and relatively consistent west-southwesterly winds. Because particulate matter emissions are the primary pollutant of concern associated with non-oil and gas minerals development there is a potential for high winds in these areas to contribute to short term increases in fugitive dust emissions from storage piles, wind erosion, and construction activities. However, the likely locations for development are not located near population centers, are not located upwind from areas identified as having particulate matter concentration levels of concern, and are located downwind from Class I and sensitive Class II areas.

## **F.2.5. Summary of Air Quality Issues**

- Recent measurements at an air monitoring station in the planning area show that measured ambient concentrations of ozone have, on several occasions, exceeded the current ozone NAAQS of 75 ppb.
- The emissions inventory showed potentially significant increases in estimated emissions of ozone forming pollutants (NO<sub>x</sub> and VOCs) which could result in increased concentrations of

ozone if oil and gas resources are authorized and developed to the full potential evaluated under each alternative. In addition, potential increases in HAP and PM<sub>2.5</sub> emissions and corresponding short term increases in ambient concentrations could result if all activities are authorized and developed to the full potential evaluated under each alternative.

- The air analysis for the RMP showed that oil and gas development activities have the potential to be the major contributor to estimated NO<sub>x</sub>, VOC, and HAP emissions. Non-oil and gas mineral development activities (i.e., sand and gravel extraction, bentonite, uranium, and gold mining) have the potential to be the major contributor to estimated PM<sub>2.5</sub> emissions.
- The geographic areas identified as having high potential for oil and gas or non-oil and gas minerals development are located in areas that are unlikely to impact Class I or sensitive Class II areas, major population centers, or areas with ambient air concentration levels of concern when Designated Development Areas, Areas of Critical Environmental Concerns, and closures are taken into account.

### **F.3. Field Office Air Resource Management Requirements**

The Lander Field Office has the responsibility to implement the decisions of the RMP in a manner that protects air quality while recognizing valid and existing leasing rights. Within the planning area, most areas with high and moderate oil and gas development potential are already leased. While the BLM has limited ability to alter the conditions of existing leases, it can require specific actions and measures necessary to protect air quality in response to identified or anticipated adverse impacts at the project level stage.

Development and implementation of appropriate protection measures is most effective at the project approval stage, because the proposed action has been defined and impacts to air quality are better able to be identified through National Environmental Policy Act analysis. As part of the project approval process the BLM will identify project-specific measures in response to identified impacts to air resources, as outlined in this air resources management plan.

#### **F.3.1. Authorization of Air Emission Generating Activities**

F.3.1.1 BLM has the authority and responsibility under Federal Land Policy and Management Act to manage public lands in a manner that will protect the quality of air and atmospheric values. Therefore, BLM may manage the pace, place, density, and intensity of leasing and development to meet air quality goals.

F.3.1.2 BLM will, prior to authorization of any activity that has the potential to emit any regulated air pollutant, consider the magnitude of potential air emissions from the project or activity, existing air quality conditions, geographic location, and issues identified during project scoping to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the project. This analysis may include; obtaining additional air monitoring data, air dispersion modeling, photochemical grid modeling, and/or mitigation measures in addition to any applicable regulatory emission limits and standards.

F.3.1.3 BLM will require project proponents to comply with the requirements under Section F.4 of this plan. BLM will review any project specific emissions inventory submitted as required under Section F.4.1 to determine its completeness and accuracy.

F.3.1.4 In areas where Wyoming Department of Environmental Quality (DEQ) approved (or equivalent) air monitoring data shows that ambient air concentrations of a regulated pollutant are at or above 85 percent of the applicable NAAQS or Wyoming Ambient Air Quality Standard (WAAQS), BLM will require the proponent for any project that has the potential to emit the pollutant or precursors to the pollutant to comply with (a) or (b) below:

- a. Demonstrate that the project will result in no net increase in annual emissions of the pollutant for the life of the project (e.g., through the application of emission control technologies, offsets, or other air emission reducing strategies); or,
- b. Demonstrate that the project will not cause or contribute to a violation of the ambient air quality standard through a quantitative air quality analysis (e.g., air dispersion modeling, photochemical grid modeling or an equivalent level of analysis).

F.3.1.5 Ambient air monitoring data in the planning area shows that existing concentrations of ozone are at or above 85 percent of the WAAQS and NAAQS and the emissions inventory for the Lander RMP shows that oil and gas development activities have the potential to be a major contributor to ozone forming pollutant emissions. Therefore, the requirements of F.3.1.4 apply and project proponents for oil and gas development activities within the planning area must comply with (a) or (b) below:

- a. Demonstrate that the project will result in no net increase in annual emissions of NO<sub>x</sub> and VOCs for the life of the project (e.g., through the application of emission control technologies, offsets, or other air emission reducing strategies); or,
- b. Demonstrate that the project will not cause or contribute to a violation of the ambient air quality standard for ozone through a quantitative air quality analysis (to include photochemical grid modeling or an equivalent level of analysis).

F.3.1.6 Ambient monitoring data within the planning area shows that existing concentrations of PM<sub>2.5</sub> are at or above 85 percent of the 24-hour National and Wyoming ambient air quality standards and the emissions inventory for the Lander RMP shows that non-mineral development and prescribed fire activities have the potential to contribute to increases in PM<sub>2.5</sub> ambient concentrations. Therefore, prior to BLM approval of a project that is likely to contribute to short term increases in PM<sub>2.5</sub> ambient concentrations, BLM will require any non-oil and gas mineral development project proponent to:

- a. demonstrate that it has applied for and obtained any required air permit from Wyoming DEQ,
- b. demonstrate that the project will not cause or contribute to a violation of the applicable ambient air quality standard and,
- c. provide a plan for controlling and minimizing fugitive dust emissions.

Prescribed fire projects will be required to minimize impacts to air quality, and will comply with local and state smoke management plans and regulations.

## **F.3.2. Monitoring**

As part of a comprehensive air management plan for the planning area, BLM commits to the following measures with regards to ambient air monitoring:

- BLM will work cooperatively with Wyoming DEQ to determine the best mechanism to submit, track, and approve project specific pre-construction monitoring or monitoring data required in a project specific record of decision (ROD),
- BLM will work cooperatively with Wyoming DEQ to share data collected from the existing BLM-operated Wyoming Air Resource Management System (WARMS) network and to

support Wyoming DEQ's air monitoring network through siting, operation, and funding of additional monitoring sites,

- BLM will continue to fund and operate the NADP monitoring site at Sinks Canyon.
- BLM may require project proponents to conduct pre-construction and/or project air monitoring as described in Section F.4.2.

### **F.3.3. Modeling**

BLM recognizes that air dispersion and photochemical grid models are useful tools for predicting project specific impacts to air quality, predicting the potential effectiveness of control measures and strategies, and for predicting trends in regional concentrations of some air pollutants. As part of a comprehensive air management plan for the planning area, BLM commits to the following with regards to air quality modeling:

- BLM will require project specific air quality modeling as outlined in Section F.4.
- BLM will ensure that project specific modeling is carried out in accordance with Environmental Protection Agency modeling guidelines and in cooperation with the air quality interagency review team.
- BLM will support and participate in regional modeling efforts through multi-state and/or multi-agency organizations such as Western Governor's Association – Western Regional Air Partnership, the Federal Leadership Forum, and Wyoming DEQ's Ozone Technical Advisory Group.

### **F.3.4. Mitigation**

BLM recognizes that many of the activities that it authorizes, permits, or allows generate air pollutant emissions that have the potential to adversely impact air quality. The primary mechanism to reduce air quality impacts is to reduce emissions (mitigation). As part of this comprehensive air management plan for the planning area, BLM commits to the following with regards to reducing emissions:

- BLM will require project proponents to include measures for reducing air pollutant emissions in project proposals and Plans of Development as described in Section F.4,
- BLM will require additional air emission control measures and strategies within its regulatory authority and in consultation with Wyoming DEQ and other federal agencies when appropriate if an operator's proposed or committed measures are insufficient to achieve air quality goals,
- BLM will ensure that air pollution control measures and strategies (both operator committed and required mitigation) are enforceable by including specific conditions in a ROD.

## **F.4. Project Specific Requirements**

BLM has identified activities and pollutants of concern for the planning area and this section contains specific requirements for project proponents. Mineral development activities, specifically oil and gas development and mining, have been identified as having the potential to contribute to increases in ambient concentrations of ozone, HAPs and PM<sub>2.5</sub>. Proponents of mineral development projects must comply with Section F.4.1 and Section F.4.4.1 at a minimum. In addition, project proponents for other activities may be required to comply with Section F.4 as determined by BLM taking into account existing air quality conditions and availability of representative air monitoring data, magnitude of estimated project emissions, meteorologic and

geographic conditions in the vicinity of the project, and the current state of air pollution control technology.

### **F.4.1. Emissions Inventory**

The proponent of a mineral development project will provide the BLM an emissions inventory that quantifies emissions of regulated air pollutants from all sources related to the proposed project, including fugitive emissions and greenhouse gas emissions, estimated for each year for the life of the project. BLM will use this estimated emissions inventory to identify pollutants of concern and to determine the appropriate level of air analysis to be conducted for the proposed project.

The BLM may require an emissions inventory for other actions depending on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

### **F.4.2. Monitoring**

F.4.2.1 The proponent of a mineral development project that has the potential to emit more than 100 tons per year of any criteria air pollutant must provide a minimum of one year of baseline ambient air monitoring data for any pollutant(s) of concern as determined by BLM, if no representative air monitoring data are being collected within 50 kilometer of the project area, or existing ambient air monitoring data are insufficient, incomplete, or does not meet minimum air monitoring standards set by Wyoming DEQ. If BLM determines that baseline monitoring is required, this pre-analysis data must meet DEQ air monitoring standards, be obtained from a site within 50 kilometer of project boundary, and cover the year immediately prior to the submittal. This requirement may be waived where the life of the project is less than one year.

F.4.2.2 The BLM may require monitoring for the life of the mineral development project depending on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

F.4.2.3 The BLM may require project proponents of other air emission generating projects to conduct baseline or life of project air monitoring depending on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

### **F.4.3. Modeling**

F.4.3.1 The proponent of a mineral development project that has the potential to emit more than 100 tons per year of any criteria pollutant will be required to conduct air quality modeling for any pollutant(s) of concern, as determined by BLM, unless the project proponent can demonstrate that the project will result in no net increase in emissions of the pollutant(s) of concern. BLM, in

cooperation with the interagency review team, will determine the parameters for the modeling analysis through the development of a project specific modeling protocol.

F.4.3.2 BLM may require air quality modeling for other air emission generating projects or for projects, actions, or management activities with estimated emissions below the threshold listed in F.4.3.1 if other criteria that warrant an air dispersion or photochemical modeling analysis are identified for purposes of analyzing project direct, indirect or cumulative impacts to air quality. Such criteria may include the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

## **F.4.4. Mitigation**

F.4.4.1 The proponent of a mineral development project will be required to minimize air pollutant emissions by complying with all applicable state and federal regulations and may be required to apply mitigation including but not limited to best available control technology, best management practices, emissions offsets, and other control technologies or strategies identified by the BLM or Wyoming DEQ in accordance with delegated regulatory authority.

F.4.4.2 The proponent of a mineral development project that has the potential to emit any regulated air pollutant will be required to provide a detailed description of operator committed measures to reduce project related air pollutant emissions including greenhouse gases and fugitive dust. Project proponents for oil and gas development projects should refer to the table of mitigation measures included in Appendix U (p. 1545) of the RMP (and in Table F.1, “Mitigation Table for Oil and Gas Development Activities” (p. 1410) below) as a reference for potential control technologies and strategies. The list is not intended to preclude the use of other effective air pollution control technologies that may be proposed.

F.4.4.3 BLM may require the proponent of other air emission generating projects to comply with F.4.4.1 and F.4.4.2 based on the magnitude of potential air emissions from the project or activity, proximity to a federally mandated Class I area, sensitive Class II area, or population center, location within a non-attainment or maintenance area, meteorologic or geographic conditions, existing air quality conditions, magnitude of existing development in the area, or issues identified during project scoping.

F.4.4.4 BLM may require project proponents to submit a contingency plan that provides for reduced operations in the event of an air quality episode. Specific operations and pollutants to be addressed in the contingency plan will be determined by BLM on a case-by-case basis taking into account existing air quality and pollutants emitted by the project.



**Table F.1. Mitigation Table for Oil and Gas Development Activities**

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
<b>Control Strategies for Drilling and Compression</b>			
Directional Drilling	Reduces construction related emissions (dust and vehicle and construction equipment emissions). Decreases surface disturbance and vegetation impacts (dust and CO <sub>2</sub> and nitrogen flux). Reduces habitat fragmentation	Could result in higher air impacts in one area with longer sustained drilling times.	Depends on geological strata
Improved engine technology (Tier 2 or better) for diesel drill rig engines	Reduced NO <sub>x</sub> , PM, CO, and VOC emissions	–	Dependent on availability of technology from engine manufacturers
Selective Catalytic Reduction (SCR) for drill rig engines and/or compressors	NO <sub>x</sub> emissions reduction, decreased formation of visibility impairing compounds, decreased formation of ozone. NO <sub>x</sub> control efficiency of 95 percent achieved on drill rig engines. NO <sub>x</sub> emission rate of 0.1 grams per horsepower hour achieved for compressors	Potential NH <sub>3</sub> emissions and formation of visibility impairing ammonium sulfate. Regeneration/disposal of catalyst can produce hazardous waste.	Not applicable to 2-stroke engines
Non-selective catalytic reduction (NSCR) for drill rig engines and/or compressors	NO <sub>x</sub> emissions reduction, decreased formation of visibility impairing compounds, decreased formation of ozone. NO <sub>x</sub> control efficiency of 80-90 percent achieved for drill rig engines. NO <sub>x</sub> emission rate of 0.7 grams per horsepower hour achieved for compressor engines greater than 100 horsepower.	Regeneration/disposal of catalysts can produce hazardous waste.	Not applicable to lean burn or 2-stroke engines
Natural Gas fired drill rig engines	NO <sub>x</sub> emissions reduction, decreased formation of visibility impairing compounds, decreased formation of ozone	–	Requires onsite processing of field gas.
Electrification of drill rig engines and/or compressors	Decreased emissions at the source. Transfers emissions to more efficiently controlled source (EGU)	Displaces emissions to EGU.	Depends on availability of power and transmission lines
Improved engine technology (Tier 2 or better) for all mobile and non-road diesel engines.	Reduced NO <sub>x</sub> , PM, CO, and VOC emissions	–	Dependent on availability of technology from engine manufacturers

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Green (also known as closed loop or flareless) completions	Reduction in VOC and CH <sub>4</sub> emissions. Reduces or eliminate flaring and venting and associated emissions. Reduces or eliminates open pits and associated evaporative emissions. Increased recovery of gas to pipeline rather than atmosphere.	Temporary increase in truck traffic and associated emissions.	Need adequate pressure and flow. Need onsite infrastructure (tanks/dehydrator). Availability of sales line. Green completion permits required by Wyoming BACT in some areas
Green workovers	Same as above.	Same as above.	Same as above.
Minimize venting and/or use closed loop process where possible during "blow downs"	Same as above.	—	Best Management Practices required by Wyoming BACT
Reclaim/remediate existing open pits, no new open pits	Reduces VOC and GHG emissions. Reduces potential for soil and water contamination. Reduces odors.	May increase truck traffic and associated emissions.	Requires tank and/or pipeline infrastructure.
Electrification of wellhead compression/pumping	Reduces local emissions of fossil fuel combustion and transfers to more easily controlled source.	Displaces emissions to EGU	Depends on availability of power and transmission lines
Wind (or other renewable) generated power for compressors	Low or no emissions.	May require construction of infrastructure. Visual impacts. Potential wildlife impacts.	Depends on availability of power and transmission lines
<b>Control Strategies Utilizing Centralized Systems</b>			
Centralization (or consolidation) of gas processing facilities (separation, dehydration, sweetening, etc.)	Reduces vehicle miles traveled (truck traffic) and associated emissions. Reduced VOC and GHG emissions from individual dehy/separator units.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure.
Liquids Gathering systems (for condensate and produced water)	Reduces vehicle miles traveled and associated emissions. Reduced VOC and GHG emissions from tanks, truck loading/unloading, and multiple production facilities.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure.
Water and/or fracturing liquids delivery system	Reduced long term truck traffic and associated emissions.	Temporary increase in construction associated emissions. Higher potential for pipe leaks/groundwater impacts.	Requires pipeline infrastructure. Not feasible for some terrain.
<b>Control Strategies for Tanks, Separators, and Dehydrators</b>			
Eliminate use of open top tanks	Reduced VOC and GHG emissions.	—	Required by Wyoming BACT for produced water tanks in some areas.

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units.	Reduces VOC and GHG emissions.	Pressure build up on older tanks can lead to uncontrolled rupture.	98 percent VOC control if $\geq 10$ TPY required statewide by Wyoming BACT
Capture and control of produced water tank emissions.	Reduces VOC and GHG emissions.	—	98 percent VOC control and no open top tanks required by Wyoming Department of Environmental Quality in some areas
Capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion.	Reduces VOC, HAP, and GHG emissions.	—	Still vent condensers required and 98 percent VOC control if $\geq 8$ TPY required statewide and in CDA by Wyoming BACT. All dehy emissions controlled at 98 percent in JPAD (no 8 TPY threshold)
<b>Control Strategies for Misc. Fugitive VOC Emissions</b>			
Install and maintain low VOC emitting seals, valves, hatches on production equipment.	Reduces VOC and GHG emissions.	—	—
Initiate an equipment leak detection and repair program (including use of FLIR cameras, grab samples, organic vapor detection devices, visual inspection, etc.)	Reduction in VOC and GHG emissions.	—	—
Install or convert gas operated pneumatic devices to electric, solar, or instrument (or compressed) air driven devices/controllers.	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	—
Use "low" or "no bleed" gas operated pneumatic devices/controllers.	Reduces VOC and GHG emissions.	—	or closed loop required statewide by Wyoming BACT
Use closed loop system or thermal combustion for gas operated pneumatic pump emissions.	Reduces VOC and GHG emissions.	—	Required statewide by Wyoming BACT (98 percent VOC control or closed loop)
Install or convert gas operated pneumatic pumps to electric, solar, or instrument (or compressed) air driven pumps.	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	Required statewide by Wyoming BACT if no thermal combustion used.
Install vapor recovery on truck loading/unloading operations at tanks.	Reduces emissions of VOC and GHG emissions.	Pressure build up on older tanks can lead to uncontrolled rupture.	Wyoming BACT analysis required if VOC $\geq 8$ TPY or HAP $\geq 5$ TPY.
<b>Control Strategies for Fugitive Dust and Vehicle Emissions</b>			
Unpaved surface treatments including watering, chemical suppressants, and gravel.	20 percent - 80 percent control of fugitive dust (particulates) from vehicle traffic.	Potential impacts to water and vegetation from runoff of suppressants.	—

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Use remote telemetry and automation of wellhead equipment.	Reduces vehicle traffic and associated emissions.	—	—
Speed limit control and enforcement on unpaved roads.	Reduction of fugitive dust emissions.	—	—
Reduce commuter vehicle trips through car pools, commuter vans or buses, innovative work schedules, or work camps.	Reduced combustion emissions, reduced fugitive dust emissions, reduced ozone formation, reduced impacts to visibility.	—	—
<b>Miscellaneous Control Strategies</b>			
Use of ultra-low sulfur diesel in engines, compressors, construction equipment, etc.	Reduces emissions of particulates and sulfates.	—	Fuel not readily available in some areas.
Reduce unnecessary vehicle idling.	Reduced combustion emissions, reduced ozone formation, reduced impacts to visibility, reduced fuel consumption.	—	—
Reduced pace of (phased) development.	Peak emissions of all pollutants reduced.	Emissions generated at a lower rate but for a longer period. LOP, duration of impacts is longer.	May not be economically viable or feasible if multiple mineral interests.
CO <sub>2</sub> Carbon Dioxide NO <sub>x</sub> Nitrous Oxides CO Carbon Monoxide EGU Electric Generating Unit VOC Volatile Organic Compound CH <sub>4</sub> Methane		NH <sub>3</sub> Ammonia BACT Best Available Control Technology GHG Greenhouse Gas HAP Hazardous Air Pollutant LOP life of plan TPY Tons per year JPAD Joint Precision Airdrop System FLIR Forward Looking Infrared	

# **Appendix G. Example Detailed, Multi-phased, Reclamation Plan**

## **Continental Divide-Creston Natural Gas Project EIS Reclamation Goal Statement**

Encourage informed decisions to minimize initial disturbance and return disturbance as quickly and effectively as possible to pre-disturbance conditions. Identify important characteristics of revegetation for evaluation of interim reclamation that serve as criteria for rollover and that are indicative that revegetation is moving toward successful reclamation.

### **A. Development of a comprehensive reclamation plan**

#### **I. Conduct a pre-disturbance inventory of proposed disturbance and reference areas**

Pre-disturbance inventories are used for two main purposes. The first is to use site-specific information to develop a reclamation plan, including treatment of soils and identification of appropriate species to include in the seed mix and the site's ability to serve as a source of seed prior to disturbance. The second purpose is to identify any issues, such as saline soils, steep topography, or invasive species that will impact successful interim and/or final reclamation.

#### **II. Describe landscape features and climate**

1. Climate and physical characteristics of the site are important factors to consider in development of a reclamation plan, particularly in identifying possible problems. For example, a site on a south-facing slope may suggest that more drought tolerant plants should be selected than if the site is on a north-facing slope. Topography (slope and aspect), climate (including postulated microclimate), and parent materials (geological substrates) are considerations in site selection and reclamation plan development.
2. Steep topography: Steep slopes that would result in site instability should be avoided. If the slope is greater than 25 percent, the BLM may advise the site be relocated.
3. Poor or erodible parent materials, or a rocky surface or, marine shales, clay/siltstone, or selenium bearing geological substrates at the surface may result in difficult reclamation conditions and should be avoided. If such areas are planned to be disturbed by the Operator, all possible resources will need to be employed by the BLM to ensure successful reclamation.
4. Available climate information, including precipitation patterns and growing season relative to the site planned for disturbance, will be addressed by the Operator in the site-specific reclamation plan in the Application for Permit to Drill (APD) approved by the BLM.

#### **III. Suitable soil inventory**

- a. Soil characteristics may strongly influence reclamation efforts. Fundamental characterization of soils ahead of disturbance can identify potential problems, so they can be addressed during disturbance, soil stockpiling and reclamation, instead of waiting for reclamation failure.
- b. The phrase “suitable soil” is used mainly because of confusion over the definition of topsoil. Soil depth, pH, electrical conductivity, texture, surface features (e.g. barren, rocky, crusty, plant litter), and organic matter content are characteristics that may be used to determine if a soil is suitable. Other information may be needed. See: “Successful restoration of severely disturbed lands: Overview of critical components,” B-1202, (and available for free at <http://ces.uwyo.edu/PUBS/B1202.pdf>).
- c. Soil characteristics that can signal a high probability of reclamation problems include: pH, electrical conductivity, soil texture, surface/subsurface features, sodium adsorption ratio, calcium carbonate content, soil compaction and saturation percentage and the below listed characteristics will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
  1. Soils with pH 7.8 and higher progressively become less suitable for reclamation and will be addressed by the Operator in the site-specific reclamation in the APD approved by the BLM.
  2. An electrical conductivity of soil greater than eight (8) dS/m and any increase in salt content of the soil above .5 dS/m will progressively negatively affect the establishment and growth of plants. Soils exhibiting these characteristics will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
  3. Soils with textures representing clay, sand or loamy sand will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
  4. Surface and subsurface soil in and through the root zone dominated by coarse material greater than 2 mm in diameter and greater than 40 percent in the soil profile to be stockpiled may signify reclamation difficulties and will be considered in the site-specific reclamation plan in the APD by the BLM and Operator.
  5. Sodium adsorption ratio (SAR) is a key diagnostic soil trait that may be determined for soils to be disturbed and placed in the suitable soil stockpile; and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
  6. Calcium carbonate content (percent lime) will control the amount of plant available phosphorus and will determined in the site-specific reclamation plan in the APD by the Operator and approved by the BLM.
  7. The soil saturation percentage will control the ability for plants to germinate and survive after reclamation actions have been taken by the Operator

and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

#### **IV. Vegetation inventory**

- a. Gathering vegetation data before a site has been cleared for drilling documents pre-disturbance site conditions and in turn guides management decisions regarding what species could be expected to successfully revegetate a site to match its existing or potential state. Seed mixes should be based on desired vegetation that has historically grown on-site and that has been shown to be successful in previous trials. Return of cover should be gauged by comparison with actual pre-disturbance site conditions and/or reference areas.
- b. Vegetation characteristics that would signal a high probability of reclamation problems:
  1. The presence of Halophytes: e.g., Saltbush
  2. The presence of Alkali Halophytes: e.g., Greasewood, Halogeton
  3. The presence of Noxious and Invasive Species: e.g., Cheatgrass, Russian thistle, Russian knapweed, Alyssum, Canada thistle.
- c. The methodologies to be used to determine the information for the vegetation inventory will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.
  1. BLM guidelines for vegetation sampling: Sampling Vegetation Attributes, Interagency Technical Reference (1996) Revised in 1997 and 1999. BLM/RS/ST-96/002+1730. 171 pages. URL for Sampling Vegetation Attributes: <http://www.blm.gov/nstc/library/pdf/samplveg.pdf>. All BLM technical references: <http://www.blm.gov/nstc/library/techref.htm>.

#### **V. Select a reference area**

- a. A reference area is a land unit which is representative, in terms of physiography, soils, vegetation and land use history, of an area to be affected by resource extraction. Reclaimed areas are compared to reference areas to determine successful interim and final reclamation.
- b. In Wyoming, a site can have multiple ecological communities surrounding it (e.g. dunes, alkali flats, and sagebrush). Ecological variation at a given site can make it difficult to evaluate which adjacent area should serve as a reference. The most accurate way to choose a reference area is to perform pre-disturbance monitoring and identify the dominant community on or adjacent to a site before construction begins. This measure ensures that initial efforts to establish vegetation are consistent with species that naturally occur at that location. A reference area located adjacent to the construction site, with similar soils, vegetation, and aspect of the area to be disturbed will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

## **B. Invasive plant management plan for construction and reclamation activities**

Disturbed sites can provide ideal opportunities for invasive plant species to propagate. Invasive plants can be transferred to the disturbed site from adjoining areas and out-compete desired vegetation during reclamation and/or spread to new areas. The best approach to combat invasive species is to use careful suitable soil handling and an appropriate seed mix. Pre-disturbance planning, including early weed management for invasive species is vital to reduce costs and ensure successful reclamation.

- a. Assess for noxious and invasive weed species before initiating surface disturbing activities, during disturbance, during interim and final reclamation, and after reclamation is completed.
- b. Web address for the Wyoming Weed and Pest Council: <http://www.wyoweed.org/>
- c. Apply weed control treatments
- d. Monitor weedy plant species at least annually to evaluate success of weed control treatments and determine if continued weed control is necessary.

## **C. Develop a reclamation plan**

Reclamation planning provides a detailed strategy for returning a disturbed site back to a functioning pre-disturbance condition. Reclamation planning also may minimize costs and greatly improves chances of successful interim and final reclamation. The reclamation plan will be made part of the APD by the Operator and BLM.

### **I. Site preparation, storm water, surface stability, and soil management for interim reclamation**

- a. Site preparation activities readies a site for revegetation activities and in general include replacement of stockpiled suitable and unsuitable soils, reestablishing a stable subsurface environment, recontouring (reconstruction of landscape), incorporation of soil amendments and primary tillage/ripping to relieve soil compaction prior to spreading suitable soil and secondary tillage using a parabolic plow just prior to seeding.
- b. Soil Management includes the handling and management of stockpiled soil on the site in a way that minimizes loss from erosion and best preserves its ability to support a productive plant community, the soil biota and their habitat as well as its physical and chemical properties.
- c. A Construction Stormwater Permit from the Wyoming Department of Environmental Quality is required any time a project results in clearing, grading, or otherwise disturbing one or more acres. The disturbed area does not need to be contiguous. The permit is required for surface disturbances associated with construction of the project, access roads, construction of wetland mitigation sites, borrow and stockpiling areas, equipment staging and maintenance areas and any other disturbed areas associated with construction. A general permit has been established for this purpose and either the Operator or general contractor is



responsible for filing a Notice of Intent (NOI) and complying with the provisions of the general permit.

- d. A reclamation plan should include a description of how the Operator will achieve the following for surface stability:
  1. Redistribute soil materials in a manner to optimize revegetation potential.
  2. Relieve compaction of the redistributed soil (suitable and unsuitable) to an appropriate depth (18-24 inches) just prior to seeding to accommodate desired plant species germination and sustained growth.
  3. Prepare the seedbed, optimize roughness, furrow on contour to prevailing wind or pit, description of technology to be used, establish surface conditions that would enhance development of diverse, stable, self-generating plant communities, and description of erosion control to be maintained on the site.
  4. reestablish slope stability and surface stability.
  5. Reconstruct the landscape to the approximate original contour or a contour consistent with the land use plan.
  6. Maximize geomorphic stability and topographic diversity of the reclaimed topography.
  7. Eliminate high walls, cut slopes, and/or topographic depressions on site, unless otherwise approved.
  8. Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.
  9. Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.
  10. Minimize wind, sheet and rill erosion on/or adjacent to the reclaimed area.
  11. There shall be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area. Site selection is the favorable method to avoid these issues.
  12. Protect seed and seedling establishment (e.g., erosion control matting, mulching, hydro-seeding, surface roughening, fencing, etc.).

## **II. Recommendations for suitable soil stockpiling to maintain soil quality**

Suitable soil for reclamation will be stockpiled on the site for use in future site reclamation and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

### **III. Describe soil amendments**

- a. Soil amendment(s) may be used in reclamation if the soil is lacking the necessary chemical, biological, physical and /or organic materials to support sustaining growth of suitable plant materials. The soil type, soil characteristics (see A., ii. b), geographic location, along with soil mapping resources available should provide the information necessary to define the soil amendment.
- b. The Operator should state what applying soil amendments is intended to accomplish. Soil amendment plans should be provided, including what amendments will be applied, method of application, timing relative to other reclamation activities (i.e. stockpiling, seeding, ripping).
- c. The soil type is defined by the soil samples obtained prior to or in some cases after disturbance takes place. Soil amendments must be scientifically calculated based on the soil characteristics (see A., ii. b) so as to provide the most cost efficient and best assurances for successful reclamation.
- d. Soil amendments include but are not limited to the following: Weed free grass hay, weed free wood chips or other weed free cellulosic materials, gypsum, elemental sulfur, and fertilizer.

### **IV. Describe seeding methods**

- a. Different plant species may require different conditions (e.g. seeding depth, seed scarification, mixing, and timing) for optimal germination success. Seeding methods should match germination characteristics of species in the seed mix and consider timing of planting to maximize germination and establishment of all reclamation species.
- b. The Operator will describe when seeding will occur and specify the methods they will use for seeding, including differential handling for different species (e.g. broadcast vs. drilling vs. Imprinting), and seeding depth in the site-specific reclamation plan of the APD. Re-seeding may need to occur if invasive and/or noxious weeds prevent establishment of the seed mix. See Appendix A below for references.

### **V. Seed mixes**

1. The need to provide multifunctional and sustainable seed mixes for interim and final reclamation and soil stability is driven by a desire to increase potential for successful and timely re-vegetation and site stability. Plant diversity and habitat functionality are directly impacted by the seed choices applied to an area slated to be reclaimed or restored. To maintain as much stability and ecological function this section makes recommendations to specifically aid an operator's selection process. Please see Appendix A for references.
  1. Select site-appropriate, adapted native plant materials based on the pre-disturbance plant community composition, site characteristics, and ecological setting. Seeds may be obtained from commercial sources of

certified weed-free seed mixes. Alternatively, local collections may be used provided they are collected in an area without weedy species.

2. Perennial naturalized species may be used when attempts to reclaim using native plants have not succeeded for a minimum of 2 full growing seasons. Reclamation should succeed using native species if soils are properly managed, precipitation is not limiting, seed mixes are carefully selected and seeded areas protected from grazing.
3. Based upon site-specific conditions, a decision may be made to use non-natives sooner than identified above and will be used in only unique conditions defined in the site-specific reclamation plan in the APD.

## **VI. Describe if and how irrigation techniques will be used in the reclamation plan**

- a. Revegetation success is highly dependent on timing and amounts of precipitation. However, variable weather in Wyoming can limit or delay successful germination and establishment of plants. Irrigation can supplement natural precipitation to insure success of newly seeded site during the initial growth period of the plant. However, overuse of irrigation may result in plants that are dependent on supplemental water, therefore irrigation practices must be used carefully and conservatively.
- b. Supplemental irrigation should be scientifically determined and applied.
- c. Both soil and water samples should be tested before application and said water source should meet appropriate limits for SAR and EC. Special consideration of soil chemistry and amendments will be a determining factor for the use of the source water.
- d. Water must be utilized from permitted sources and should be permitted for such purposes. Produced water from sources, i.e. "coal bed natural gas wells" must adhere to discharge permits and be recognized by the WDEQ. Water utilized from sub surface water wells must be permitted and in good standing with State Engineers Office.
- e. Irrigation can be cost prohibitive and should not be a requirement for reclamation but used as a tool to enhance vegetative growth.

## **VI- Describe best management practices**

### **I.**

Best Management Practices (BMPs) are techniques that can be applied to surface disturbance and reclamation actions to aid in reclamation success. Identify the appropriate BMPs during planning and they can guide the surface disturbance and reclamation process. Additionally, documenting BMPs provides opportunities to evaluate for success, so BMPs can be modified for future use in similar conditions. Please see Appendix A for BLM recommendations.

## **VI- Description of monitoring and reporting protocols for reclamation**

### **II. rollover**

- a. Site Monitoring is conducted to observe and keep track of environmental conditions on the reclaimed site. Specifically, monitoring is done to document proper development of the reseeded plant community, soil stability and proper ecosystem function. Continued characterization after disturbance and during interim reclamation is appropriate for monitoring site maturation and stability, particularly when problematic soil conditions or invasive weeds are identified.
- b. Vegetative monitoring and disturbed site evaluation for any component of the reclamation plan applicable to the APD shall take place at intervals agreed to by the BLM and the Operator with input by any entity who utilizes the surface estate (i.e. grazing permittee) of the disturbed site. Generally, the intervals for monitoring and reporting will be set annually by the BLM unless otherwise documented in the site-specific reclamation plan for the APD. The Interim Reclamation Objective (IRO) achievement by the Operator will reduce the mandatory monitoring and reporting described in the reclamation plan to a time period agreed to by the Operator and BLM and will be added to the site-specific reclamation plan by the BLM. Once the disturbed site achieves the IRO, the site will be subject to all applicable requirements of the reclamation plan until a time that the Final Reclamation Objective (FRO) is achieved by the Operator and approved by the BLM. Once the BLM has accepted the site for IRO status the BLM will also notify the Operator of the resulting acreage gained for reclamation rollover.
- c. The interim reclamation objective (IRO) is to reconstruct and revegetate the portion of the disturbed land unused for long term production and establish the vegetative cover sufficient to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual and forage loss during the life of the well and/or facilities.
- d. The long-term final reclamation objective (FRO) is to return the land to a condition that which existed prior to disturbance with allowances for an improved and/or stable ecological condition, if possible. This includes reconstruction of the landform to its original state along with reestablishment of a stable vegetative community, hydrologic systems, visual resources, and wildlife habitats. To ensure that the FRO will be achieved and maintained through human and natural processes, actions will be taken to ensure standards are met for site stability, visual quality, hydrological functioning, and vegetative productivity beyond the end of the life of the well or facilities.
- e. Monitoring should be designed and implemented by the Operator to document continuing successful interim reclamation for reclamation rollover using methodologies approved by BLM.
  1. Once the IRO is achieved and reclamation rollover granted by BLM, the Operator will continue to monitor the condition of the reclamation, document that the revegetation continues to meet IRO, and that the revegetation trajectory is toward achievement of final reclamation objectives as defined in the site-specific reclamation plan approved by BLM.

2. Identify potential problems and determine appropriate mitigation measures with the implementation of adaptive management.

- f. The required elements of monitoring to assess IRO and FRO will be identified and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM. Please see Appendix A for additional information.

**D. Indicators for successful achievement for the IRO resulting in reclamation rollover**

**I. Beginning Monitoring**

Monitoring should begin the first growing season. Evaluation is possible after a minimum of two full growing seasons.

**II. Irrigation and monitoring**

If irrigation is used initially, then the reclamation may be evaluated for interim reclamation success two (2) full growing seasons after irrigation ceases to assure that the plant community can survive without supplemental water.

**III. The IRO reclamation rollover criteria is as depicted in the Rawlins Field Office RMP vs alternative criteria if this process is followed**

The Current Rawlins Field Office RMP states “Criteria based on predisturbance surveys or surveys of adjacent undisturbed natural ground cover and species composition (The vegetation will consist of species included in the seed mix and/or occurring in the surrounding natural vegetation or as deemed desirable by BLM in review and approval of the reclamation plan. No single species will account for more than 30 percent total vegetative composition unless it is evident at higher levels in the adjacent landscape. Vegetation canopy cover production and species diversity shall approximate the surrounding undisturbed area ) or—

- Eighty percent of predisturbance ground cover and ninety percent dominate species.

Should this pre-disturbance protocol be followed, it is our recommendation to provide an alternative to the above language and have revegetation cover be 70 percent of reference area cover to meet interim criteria. All of this 70 percent must be desirable perennial species as represented by the seed mix. Items D, I, ii and iv through ix would also need to be followed to interim reclamation criteria.

**IV. Monitoring results must be from a standardized cover/species protocol finalized by BLM**

**V. Noxious weeds**

No noxious weeds will be allowed.

**VI. Invasive weeds**

Invasive weed species cover no greater than adjacent invasive species cover. All other undesirable perennial or annual plants as defined in the site-specific APD shall be continually controlled or eradicated on the original disturbed area.

**VI- Undesirable/annual plants**

I.

For purposes of successful Interim Reclamation Objective (IRO) achievement, the amount of undesirable perennial or annual plant species shall be as represented in the site-specific reclamation plan and determined by vegetative monitoring of the disturbed area and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

**VI- Vegetative trending**

II.

If vegetative trending is not positive within 3 full growing seasons without irrigation or 2 years after irrigation, the BLM and Operator will determine through adaptive management the needs for the disturbed site.

**IX. Erosion**

Erosion features equal to or less than surrounding area.

**E. The monitoring data reporting required of the Operator as specified in the Rawlins RMP (with some additions to clarify and flow with document-original language in Appendix 36 of the Rawlins RMP)**

Reclamation Monitoring Reporting Data required to be obtained and filed by the Operator.

<b>General</b>
WYW# (Oil and Gas Lease or Right-of-Way (ROW)) Project Name: Project Type (e.g. Well, Access Road, Pipeline, Facility, Wind) Qtr/Qtr Sec, T, R, County, State
<b>Disturbance</b>
Disturbance Dates Start-End Reclamation Type (Interim/Final)
<b>Reclamation</b>
Earthwork Contractor Name Earthwork Completion Date Soil Preparation Ripping Depth (prior to re-spreading suitable soil) Area (Acres or Square Feet) Seeding Contractor Name Seeding Date Seedbed/Compaction Release Preparation Methods (Describe -Rip, Disc, Harrow, Parabolic, Depths)
<b>Seeding</b>
Seeding Method (Drill, Broadcast, Imprint, Depths) Copy of Seed Tag (Species %, Purity %, Germination %) Actual Seeding Rate (Lbs/Acre of each species) Area Seeded (Acres or Square Feet) Soil Amendments Used (Describe)
<b>Other</b>
Mulching/Erosion Netting/Tackifier used – yes/no and describe Fenced Location yes/no Snow Fencing yes/no
<b>Weeds</b>

Type(s) of Weed Treated - List Weed Contractor Name Contractor License # Weed Treatment Date Weed Treatment Type (Chemical, Mechanical) Chemicals Used and Rates Applied Area Treated (Acres or Square Feet) (GIS Extent and Location)
<b>Inspection</b>
Inspector's Name, Company, ID Inspection Date Time after Seeding (which Growing season) Seedlings/Square Feet Growing Percent and Extent of Bare Soil (Describe) Percent Ground Cover (Describe) Percent Desirable Species (Describe) Percent Noxious/Invasive Weeds (Describe) Erosion Features Present? (Describe) Evidence of Livestock Grazing (Describe) Reclamation Successful (Yes/No)
<b>Reporting</b>
Completed Spreadsheet or Database as defined by BLM GIS Layer With Attribute Table With Site Data as Detailed Detail Disturbance Extent and Location Permanent Photo Reference Point -Describe
<b>Monitoring</b>
Reference Photos Close-Up Photos Reseeding yes/no
<b>Future Management Prescription</b>
Weed Control Needed - yes/no and explanation Erosion control Needed - yes/no and explanation Grazing/Predation Issues - yes/no and explanation Other Cultural or Mechanical Needs - yes/no and explanation Record -yes/no and explanation

## ***Appendix A***

### **A. Suggestions on Stockpiling Suitable and Unsuitable Soils to Maintain Soil Quality**

Stockpiled topsoil should not be piled too deeply or too shallow. The taller or deeper the piles, the more soil is buried under large amounts of pressure resulting in compaction. Soil buried deep in the pile also has little exposure to oxygen resulting in anaerobiosis; deeply buried soil also has no organic matter input. Both of these problems reduce soil quality.

Shallow or small topsoil stockpiles have large footprints on the land surface with the disadvantage of covering greater areas of undisturbed soil which will, in turn, require revegetation, resulting in a greater overall amount of disturbed soil. Smaller or shallow stockpiles also have a greater surface area per amount of soil stored which increases exposure of the stockpiled soil to wind and water erosion. The surface of soil stockpiles should always be vegetated to minimize erosion losses.

1. Salvaged stockpiles of suitable soil should be no deeper than 4 meters (13 feet) and should be less where possible.

2. Stockpile slopes should not exceed 5:1 angles (20 percent slopes) to allow for seeding and minimize erosion.
3. Suitable Soil stockpiles should be located in areas to prevent their disturbance and contamination by well pad activities. They should not be placed in streambeds or ephemeral drainages where they may be washed away. They should be protected from wind erosion.
4. A perimeter ditch/berm should be constructed around the stockpile for topsoil conservation and sediment control.
5. All suitable soil stockpiles should be seeded with native cool season grass to provide cover and protect them from water and wind erosion. Before seeding, the stockpile may be scarified along contours to minimize wind and water erosion.
6. If soil horizons or layers are to be stratified during soil salvage (stripping) operations, soil maps should be made of the well pad area to identify depths of soil horizons and surface slope. The pad area to be cleared of soils should then be divided into strips the size of the blades or equipment being used for soil removal. The depth of soil removal from each swath should be clearly marked so that equipment operators are removing a uniform layer from each strip. After the topsoil is removed from the area in this manner, the subsoil can then be removed in the same fashion, strip by strip, each strip at a uniform depth.

#### **B. Suggestions on Supplemental Irrigation**

Supplemental irrigation should be scientifically determined and applied in the initial four to six week period of growth of the seedling plants and then ended. Such determination could be the application of an amount of irrigation water equivalent to the average or average plus 25 percent of the precipitation expected during a given interval.

#### **C. Suggestions on Vegetation and Soil Monitoring**

Examples of monitoring components are listed below:

1. Reference: <http://agriculture.wy.gov/forms/natres/rangelandmonitoring.pdf>
2. Operators should use the same locations and methods used at baseline for repeat photography. Additional locations may be selected to document progress of reclaimed area to demonstrate interim and final reclamation success, and to monitor any identified problems such as erosional features. The site should be photographed once every year normally at the same time period, from the same locations and direction so that photographs are repeated through time. Photographs should be taken during the growing season.
3. Weed assessment: Disturbed and reclaimed areas should be evaluated for noxious and invasive weeds at least annually. Weed control should be promptly implemented by the Operator once weed species and infestations are identified. Weed control applied at planned chemical rates at times the weed is emerging can have positive impacts in minimizing weed growth through-out the year as well as promoting the growth of grass species. The timing of the control should be determined by the growth habits



of the weed species and when they are most effectively assessed. If weeds persist, reseeding the site could be considered as well as the species of grass, forb or shrub.

4. Erosion control/soil stability: The reclaimed area should be evaluated for any signs of erosion problems annually and when the site is subject to erosional events. Identified erosion features should be monitored using repeat photography. Absence of erosion features is a positive indication that the soil is stabilizing.
5. Cover and composition data should be used to document that the plant community continues to trend toward the requirements to achieve interim and final reclamation success. The data should be used to evaluate if species composition and cover are increasing. These factors should be considered relative to the number of species in the seed mix, the selected reference area, and offsite responses to seasonal growing conditions.
6. Plant community cover and composition measurements: The Operator should start collecting cover and composition data beginning in the first (1st) growing season after disturbance. Data should be collected using repeatable methods approved by the appropriate regulatory authority (BLM) and should be the same methods that were used to describe vegetation for baseline (or reference area). The same methods should be used each time the vegetation is monitored.
7. Soils should be monitored if reclamation problems suggest that soils might be the problem. Such problems include but are not limited to salt crusts, clay crusts, wind and/or water erosion and rapid changes in pH (up or down) Recommended soil monitoring would include sampling soils and analysis of soil characteristics as described in the Development of a comprehensive plan section.

#### D. Web Links

<b>Equipment</b>
Equipment — <a href="http://www.reveg-catalog.tamu.edu">http://www.reveg-catalog.tamu.edu</a> Equipment — <a href="http://www.nsl.fs.fed.us/great_basin_native_plants.html">http://www.nsl.fs.fed.us/great_basin_native_plants.html</a> Mats — <a href="http://www.newparkmats.com">www.newparkmats.com</a> Electric fence — <a href="http://www.hcam.net">www.hcam.net</a> SpiderPlow — <a href="http://www.spiderplowinternational.com">www.spiderplowinternational.com</a> Truax — <a href="http://www.truaxcomp.com/">http://www.truaxcomp.com/</a>
<b>Government</b>
2006 Gold Book — <a href="http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html">http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html</a> BLM engineering drawings, roads & fences — <a href="http://www.blm.gov/nstc/eng/draw.html">http://www.blm.gov/nstc/eng/draw.html</a> BLM VRM — <a href="http://www.blm.gov/nstc/VRM/">http://www.blm.gov/nstc/VRM/</a> BLM NSTC — <a href="http://www.blm.gov/nstc/">http://www.blm.gov/nstc/</a> EPA — <a href="http://www.epa.gov/owow/nps/">http://www.epa.gov/owow/nps/</a> and <a href="http://www.blm.gov/bmp/">http://www.blm.gov/bmp/</a> New Onshore Order #1, May 7-07 — <a href="http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/07-934.pdf">http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/07-934.pdf</a> Wyoming BLM requirements — <a href="http://www.wy.blm.gov/minerals/og/">http://www.wy.blm.gov/minerals/og/</a> Wyoming Climate Atlas — <a href="http://www.wrds.uwyo.edu/sco/climate_office.html">http://www.wrds.uwyo.edu/sco/climate_office.html</a> WY DEQ — <a href="http://deq.state.wy.us/wqd/watershed/nps/npspg.htm">http://deq.state.wy.us/wqd/watershed/nps/npspg.htm</a> NRCS fotog — <a href="http://efotg.nrcs.usda.gov/treemenuFS.aspx">http://efotg.nrcs.usda.gov/treemenuFS.aspx</a>
<b>Journals</b>

American Society of Mining and Reclamation — <a href="http://dept.ca.uky.edu/asmr/W/">http://dept.ca.uky.edu/asmr/W/</a> Global Restoration Network — <a href="http://www.globalrestorationnetwork.org">www.globalrestorationnetwork.org</a> Journal Range Management archives — <a href="http://jrm.library.arizona.edu/jrm/">http://jrm.library.arizona.edu/jrm/</a> National Roadside Vegetation Management Association — <a href="http://www.nrvma.org">http://www.nrvma.org</a> Society for Ecological Restoration (SER) — <a href="http://www.ser.org/">http://www.ser.org/</a> USFS Rocky Mountain Research Station publications — <a href="http://www.treeseearch.fs.fed.us/pubs/rmrs/">http://www.treeseearch.fs.fed.us/pubs/rmrs/</a> Wyoming Native Plant Society — <a href="http://uwadmnweb.uwyo.edu/wyndd/wnps/plant_id.htm">http://uwadmnweb.uwyo.edu/wyndd/wnps/plant_id.htm</a>
<b>Maps/GIS</b>
Topo & aerial photos — <a href="http://geonames.usgs.gov/pls/gnispublic/f?p=171:1:6176131719238320356">http://geonames.usgs.gov/pls/gnispublic/f?p=171:1:6176131719238320356</a> NRCS National Water and Climate Center — <a href="http://www.wcc.nrcs.usda.gov/wcc.html">http://www.wcc.nrcs.usda.gov/wcc.html</a> Water Erosion Prediction project — <a href="http://octagon.nserl.purdue.edu/weppV1/">http://octagon.nserl.purdue.edu/weppV1/</a> Wyoming Geographic Information Science Center — <a href="http://www.wygisc.uwyo.edu/">http://www.wygisc.uwyo.edu/</a>
<b>Mycorrhizae</b>
<a href="http://mycorrhiza.ag.utk.edu/default.html">http://mycorrhiza.ag.utk.edu/default.html</a> <a href="http://invam.caf.wvu.edu/index.html">http://invam.caf.wvu.edu/index.html</a> <a href="http://www.ars.usda.gov/is/pr/2003/030205.htm">http://www.ars.usda.gov/is/pr/2003/030205.htm</a>
<b>Oil/Gas</b>
Completion and workover wastes — <a href="http://www.epa.gov/epaoswer/other/oil/w&amp;c.pdf">http://www.epa.gov/epaoswer/other/oil/w&amp;c.pdf</a> Dust suppression — <a href="http://www.oznet.ksu.edu/Stevenson/Dust%20Manual%20%20102704.pdf">http://www.oznet.ksu.edu/Stevenson/Dust%20Manual%20%20102704.pdf</a> Hydraulic Fracturing (Fracking or Frac Job) — <a href="http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf">http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf</a> <a href="http://www.epa.gov/safewater/uic/cbmstudy/pdfs/completestudy/ch4_6-8-04.pdf">http://www.epa.gov/safewater/uic/cbmstudy/pdfs/completestudy/ch4_6-8-04.pdf</a> National LTAP & TTAP Rural Roads — <a href="http://www.ltapt2.org/resources/ruralresources.php">http://www.ltapt2.org/resources/ruralresources.php</a> Oil & Gas Production wastes — <a href="http://www.epa.gov/epaoswer/other/oil/oil-gas.pdf">http://www.epa.gov/epaoswer/other/oil/oil-gas.pdf</a> Power lines — <a href="http://www.aplic.org/">http://www.aplic.org/</a> Produced water — <a href="http://www.iogcc.state.ok.us/PDFS/2006-Produced-Water-Guidebook.pdf">http://www.iogcc.state.ok.us/PDFS/2006-Produced-Water-Guidebook.pdf</a> The T <sup>2</sup> /LTAP Center University of Wyoming — <a href="http://www.weng.uwyo.edu/wyt2/">http://www.weng.uwyo.edu/wyt2/</a> Western Governors CBM BMPs — <a href="http://www.westgov.org/wga/initiatives/coalbed/CoalBedMethane.pdf">http://www.westgov.org/wga/initiatives/coalbed/CoalBedMethane.pdf</a> Wyoming Oil and Gas Commission requirements — <a href="http://wogcc.state.wy.us/">http://wogcc.state.wy.us/</a>
<b>Restoration Handbooks</b>
Bags Quiet Presence NRCS — <a href="http://www.wy.nrcs.usda.gov/Plant/tech_notices.html">http://www.wy.nrcs.usda.gov/Plant/tech_notices.html</a> Dryland pastures — <a href="http://www.montana.edu/wwwpb/pubs/eb19.pdf">http://www.montana.edu/wwwpb/pubs/eb19.pdf</a> Handbook of Western Reclamation Techniques — <a href="http://cbmcc.org/intro06.pdf">http://cbmcc.org/intro06.pdf</a> Restoring Western Ranges and Wild lands — <a href="http://www.fs.fed.us/rm/pubs/rmrs_gtr136.html">http://www.fs.fed.us/rm/pubs/rmrs_gtr136.html</a> Solid Minerals reclamation handbook — <a href="http://www.blm.gov/nhp/efoia/wo/fy01/ib2001-081attach.pdf">http://www.blm.gov/nhp/efoia/wo/fy01/ib2001-081attach.pdf</a>
<b>Scientific Literature</b>
An Introduction to using native plants in Restoration — <a href="http://www.wy.nrcs.usda.gov/Plant/tech_notices.html">http://www.wy.nrcs.usda.gov/Plant/tech_notices.html</a> Geology and Plant life — <a href="http://www.wy.nrcs.usda.gov/Plant/tech_notices.html">http://www.wy.nrcs.usda.gov/Plant/tech_notices.html</a> Managing Arid and semi-arid watersheds — <a href="http://www.wy.blm.gov/botany/wyspecies.htm">http://www.wy.blm.gov/botany/wyspecies.htm</a> <a href="http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oil.html">http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oil.html</a> Revegetation Abstracts — <a href="http://www.wy.nrcs.usda.gov/Plant/tech_notices.html">http://www.wy.nrcs.usda.gov/Plant/tech_notices.html</a> Sagebrush — <a href="http://sagemap.wr.usgs.gov/sage_grouse_documents.htm">http://sagemap.wr.usgs.gov/sage_grouse_documents.htm</a> Salt tolerant plants — <a href="http://www.ussl.ars.usda.gov/pls/caliche/Halophyte.query">http://www.ussl.ars.usda.gov/pls/caliche/Halophyte.query</a> USDA Plant database — <a href="http://plants.usda.gov/">http://plants.usda.gov/</a> Wyoming Natural Diversity Database — <a href="http://uwadmnweb.uwyo.edu/wyndd/">http://uwadmnweb.uwyo.edu/wyndd/</a> Wyoming Plant Materials Technical notes — <a href="http://www.wy.nrcs.usda.gov/Plant/tech_notices.html">http://www.wy.nrcs.usda.gov/Plant/tech_notices.html</a> Wyoming Reclamation and Restoration Center — <a href="http://uwadmnweb.uwyo.edu/WRRC/">http://uwadmnweb.uwyo.edu/WRRC/</a>
<b>Seed Sources</b>

<p>Guidebook to Great Basin seeds —  <a href="http://www.id.blm.gov/techbulbs/05_04/entiredoc.pdf">http://www.id.blm.gov/techbulbs/05_04/entiredoc.pdf</a>  <a href="http://www.graniteseed.com/">http://www.graniteseed.com/</a>  <a href="http://uwacadweb.uwyo.edu/seedlab/default.htm">http://uwacadweb.uwyo.edu/seedlab/default.htm</a>  <a href="http://www.windriverseed.com/">http://www.windriverseed.com/</a>  <a href="http://www.pawneebuttesseed.com/">http://www.pawneebuttesseed.com/</a>  <a href="http://www.westernnativeseed.com/">http://www.westernnativeseed.com/</a>  <a href="http://www.avseeds.com/company.cfm">http://www.avseeds.com/company.cfm</a>  <a href="mailto:native@rmnativeplants.com">native@rmnativeplants.com</a>  <a href="http://www.graniteseed.com">www.graniteseed.com</a>  Native Plant Propagation Protocols — <a href="http://www.nativeplants.for.uidaho.edu/network">http://www.nativeplants.for.uidaho.edu/network</a> Native Seed Network — <a href="http://www.nativeseednetwork.org/index">http://www.nativeseednetwork.org/index</a> Oregon state Seed Lab - quality testing of native seed — <a href="http://www.seedlab.oscs.oregonstate.edu">www.seedlab.oscs.oregonstate.edu</a>  Seed testing protocols — <a href="http://www.aosaseed.com/reference.htm">http://www.aosaseed.com/reference.htm</a></p>
<b>Snow Fence</b>
<a href="http://www.snow-snake.com/">http://www.snow-snake.com/</a>
<b>Soil</b>
<p>Glossary of Soil Science Terms — <a href="https://www.soils.org/sssagloss/?check">https://www.soils.org/sssagloss/?check</a>  NCSS Web Soil Survey —  <a href="http://www.wy.nrcs.usda.gov/Plant/tech_notices.html">http://www.wy.nrcs.usda.gov/Plant/tech_notices.html</a>  <a href="http://www.nrcs.usda.gov/">http://www.nrcs.usda.gov/</a>  <a href="http://soils.usda.gov/sqi/concepts/soil_biology/index.html">http://soils.usda.gov/sqi/concepts/soil_biology/index.html</a>  NRCS Soil Quality Publications — <a href="http://www.wy.nrcs.usda.gov/Plant/tech_notices.html">http://www.wy.nrcs.usda.gov/Plant/tech_notices.html</a>  Soil series name search — <a href="http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdnamequery.cgi">http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdnamequery.cgi</a></p>
<b>Weeds</b>
<p>Halogeton — <a href="http://64.233.161.104/search?q=cache:jIdL39NFvUEJ:wfr.usgs.gov/pubs/journalpdf/dudabiolfertilsoils.pdf+halogeton+competition&amp;hl=en">http://64.233.161.104/search?q=cache:jIdL39NFvUEJ:wfr.usgs.gov/pubs/journalpdf/dudabiolfertilsoils.pdf+halogeton+competition&amp;hl=en</a>  Weed Science Society of America — <a href="http://www.wssa.net">http://www.wssa.net</a>  TNC Invasive species (weeds) — <a href="http://tncweeds.ucdavis.edu/control.html">http://tncweeds.ucdavis.edu/control.html</a></p>
<b>Wildlife</b>
<p>Important Wildlife Habitats — <a href="http://gf.state.wy.us/downloads/pdf/og.pdf">http://gf.state.wy.us/downloads/pdf/og.pdf</a> Sage grouse range wide forum links: <a href="http://sagegrouse.ecr.gov/?link=110">http://sagegrouse.ecr.gov/?link=110</a>  Recommendations for Development of Oil and Gas Resources within Crucial and Important Habitats — <a href="http://gf.state.wy.us/downloads/doc/O&amp;G%20Recommendations%20April%202010%20with%20changes%20identified.pdf">http://gf.state.wy.us/downloads/doc/O&amp;G%20Recommendations%20April%202010%20with%20changes%20identified.pdf</a></p>

## E. Participants

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## Appendix H. Best Management Practices

Best management practices (BMPs) are environmental protection measures developed by governmental bodies, industry, and scientific or other working groups. BMPs are mitigation measures applied on a site-specific basis to reduce, prevent, or avoid adverse environmental or social impacts. These practices are applied to help ensure that development is conducted in an environmentally responsible manner. Some BMPs are as simple as choosing a paint color that helps oil and natural gas equipment blend with the natural surroundings, turning development almost invisible. Other BMPs may reduce the amount of vegetation lost to development, may speed the re-growth of vegetation, or may reduce the amount of wildlife disturbance in important habitats. Public land users are encouraged to review these practices, incorporate them where appropriate, or develop better methods for achieving the same goal.

The purpose of this section is not to select certain practices or designs and require that only those be used. It is not possible to evaluate all the known practices and make determinations as to which are best. BMPs should be matched and adapted to meet the site-specific requirements of the management action, project and local environment. No one management practice is best suited to every site or situation. BMPs must be adaptive and monitored regularly to evaluate effectiveness.

The following sources contain information regarding the development and implementation of BMPs. These references are not to be considered as exclusive sources of information; rather, they should be used as a starting point when evaluating specific BMPs during project design and implementation.

### **Bureau of Land Management (BLM) BMP Resources**

*BLM BMPs:* This website provides an introduction to BLM BMPs with links to BLM contacts, specific resources, and other BMP links, and other resources related to BLM BMPs.  
<http://www.blm.gov/bmp/>

*General Information for Oil and Gas BMPs:* This resource provides general information regarding BLM BMPs for oil and gas development. A sample of BMPs are provided with a brief description of types of BMPs and terminology.  
[http://www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/best\\_management\\_practices/general\\_information.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/general_information.html)

*BMP Frequently Asked Questions:* The link below provides responses to frequently asked questions regarding BLM BMPs.  
[http://www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/best\\_management\\_practices/frequently\\_asked\\_questions.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/frequently_asked_questions.html)

*BMP Technical Information:* The slide shows at the link below provide a detailed look at a menu of possible oil and natural gas development BMPs. These slide shows are only a starting point and are not intended to serve as a comprehensive list of BMPs.  
<http://www.blm.gov/nhp/efoia/wo/fy05/im2005-069.htm>

*Oil and Gas Exploration – The Gold Book:* The publication Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book) was developed to assist operators by providing information on the requirements for obtaining permit approval and conducting environmentally responsible oil and gas operations on federal lands and on private surface over federal minerals (split-estate). Split-estate surface owners

will also find the Gold Book to be a useful reference guide. In 2007, the Gold Book was updated to incorporate changes resulting from the new Onshore Oil and Gas Order No. 1 regulations.  
[http://www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/best\\_management\\_practices/gold\\_book.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html)

*Visual Resources:* There are numerous design techniques that can be used to reduce the visual impacts from surface-disturbing projects. The techniques described here should be used in conjunction with BLM's visual resource contrast rating process wherein both the existing landscape and the proposed development or activity are analyzed for their basic elements of form, line, color, and texture.  
<http://www.blm.gov/nstc/VRM/destech.html>

*Renewable Energy Development BMPs:* The following resources provide information on BMPs related to renewable energy development.

- *Wind Energy Development Programmatic Environmental Impact Statement [EIS]:* The scope of the Wind Energy Programmatic EIS analysis includes an assessment of the beneficial and adverse environmental, social, and economic impacts; discussion of relevant mitigation measures to address these impacts; and identification of appropriate, programmatic policies and BMPs to be included in the proposed Wind Energy Development Program.  
<http://windeis.anl.gov/documents/fpeis/index.cfm>
- *BLM Instruction Memorandum [IM] 2009-043, Rights-of-Way, Wind Energy:* This IM further clarifies the BLM Wind Energy Development policies and BMPs provided in the Wind Energy Development Programmatic EIS.  
[http://www.blm.gov/wo/st/en/info/regulations/Instruction\\_Memos\\_and\\_Bulletins/national\\_instruction/2009/IM\\_2009-043.html](http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-043.html)
- *Record of Decision for the Geothermal Resource Leasing Programmatic Environmental Impact Statement:* This Record of Decision provides a list of sample BMPs that have been collected from various BLM and United States Forest Service documents addressing geothermal and fluid mineral leasing and development, including resource management plans, forest plans, and environmental reports for geothermal leasing and development. The document provides guidance on incorporating BMPs, as appropriate, into the geothermal permit application or as Conditions of Approval.  
[http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS\\_REALTY\\_AND\\_RESOURCE\\_PROTECTION/\\_energy/geothermal\\_eis/final\\_programmatic.Par.90935.File.dat/ROD\\_Geothermal\\_12-17-08.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS_REALTY_AND_RESOURCE_PROTECTION/_energy/geothermal_eis/final_programmatic.Par.90935.File.dat/ROD_Geothermal_12-17-08.pdf)
- *Solar Energy Development Programmatic Environmental Impact Statement:* This Programmatic EIS is currently under development (as of Summer 2011) and when finalized will include policies and mitigation measures adopted as part of the proposed solar energy deployment program. The Solar Energy Development Programmatic EIS will identify for the Department of Energy, industry, and stakeholders the best practices for deploying solar energy and ensuring minimal impact to natural and cultural resources on BLM-administered lands or other federal, state, tribal, or private lands.  
<http://www.solareis.anl.gov/>

## U.S. Environmental Protection Agency (EPA) BMP Resources

*Healthy Watersheds:* This resource provides conservation approaches and tools designed to ensure healthy watersheds remain intact. The website provides example approaches that are generally site-specific, and watershed managers are encouraged to use the examples as guidance in developing local conservation strategies. The website also supplies outreach strategies to encourage stakeholder engagement in conservation and protection of healthy watersheds.  
<http://www.epa.gov/owow/nps/>

*Storm Water BMPs:* This online menu provides BMPs designed to meet the minimum requirements for six control measures specified by the EPA's Phase II Stormwater Program. The control measures include public education, public involvement, illicit discharge detection and elimination, construction, post-construction, and pollution prevention/good housekeeping. The menu also provides case studies assessing the performance of various storm water BMPs.  
<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm>

*Pasture, Rangeland, and Grazing Operations BMPs:* The link below provides BMPs compiled by the EPA to prevent or reduce pollution associated with livestock grazing. Topics include practices to reduce methane production, managing nonpoint source pollution, controlled grazing, reducing animal feeding operation pollution, and manure management.  
<http://www.epa.gov/oecaagct/anprgbmp.html>

## **U.S. Department of Agriculture – Natural Resources Conservation Service (NRCS) BMP Resources**

*National Conservation Practice Standards:* This website provides links for national conservation practices developed by the NRCS on topics such as herbaceous wind barriers, feed management, forest stand improvement, and irrigation management. The conservation practice standard contains information on why and where the practice is applied, and sets forth the minimum quality criteria that must be met during the application of that practice in order for it to achieve its intended purpose.  
<http://www.nrcs.usda.gov/Technical/Standards/nhcp.html>

*National Range and Pasture Handbook:* Developed by NRCS grazing land specialists, this handbook provides a source of expertise to guide cooperators in solving resource problems and in sustaining or improving their grazing lands resources and operations.  
<http://www.glti.nrcs.usda.gov/technical/publications/nrph.html>

## **Wyoming Game and Fish Department BMP Resources**

*Aquatic Invasive Species:* This resource provides information about how to recognize aquatic invasive species and how to avoid introducing them or spreading them through Wyoming's waters. The website contains links to external resources including a link to waterbodies in the United States currently known to be impacted by zebra and quagga mussels. The website also contains information about how to decontaminate equipment and watercraft suspected of harboring aquatic invasive species.  
<http://gf.state.wy.us/fish/AIS/index.asp>

# Appendix I. Stipulations and Conditions of Approval in Designated Development Areas and in Non-Designated Development Areas

**Table I.1. Application of Stipulations and/or Conditions of Approval (COAs) for Wellsite Activities on New Oil and Gas Leases in Designated Development Areas (DDAs) and in Non-DDAs**

Activities	Designated Development Areas	Non-Designated Development Areas
All Preliminary Activities (casual use before APD)	Stipulations and/or COAs not applied	Stipulations and/or COAs not applied
All Site Construction	Stipulations and/or COAs applied	Stipulations and/or COAs applied
All Drilling	Stipulations and/or COAs applied	Stipulations and/or COAs applied
All Completion	Stipulations and/or COAs applied	Stipulations and/or COAs applied
All Surface Facilities Activities (normally overlaps completion activities)	Stipulations and/or COAs applied	Stipulations and/or COAs applied
All Pipeline/Flow line (normally overlaps completion activities)	Stipulations and/or COAs applied	Stipulations and/or COAs applied
Plug and Abandon Wells	Stipulations and/or COAs applied	Stipulations and/or COAs applied
Reclamation	Timing Limitation Stipulations and/or COAs applied but exceptions usually are granted to improve reclamation success.	Timing Limitation Stipulations and/or COAs apply and exceptions are granted only if necessary for reclamation success and limited impacts to wildlife are expected.
Short-Term Well Maintenance and Miscellaneous Activities <ul style="list-style-type: none"> <li>Well pumper</li> <li>Minor facility repair</li> <li>Spill remediation</li> <li>Haul condensate and produced water</li> <li>Weed control</li> <li>Written order/INC remediation</li> </ul>	Timing Limitation Stipulations and/or COAs not applied	Timing Limitation Stipulations and/or COAs not applied
More Intensive Well Maintenance and Miscellaneous Activities <ul style="list-style-type: none"> <li>Replace and install production facilities</li> <li>Excavate temporary flare and completion pit</li> <li>Replace flow line on location</li> <li>Road maintenance</li> <li>Workover/recompletion/downhole repairs</li> </ul>	Timing Limitation Stipulations and/or COAs not applied	Timing Limitation Stipulations and/or COAs applied
APD Application for Permit to Drill COAs Conditions of Approval		



# Appendix J. Wyoming Standards for Healthy Rangelands

## Introduction

According to the Department of the Interior's final rule for grazing administration, effective August 21, 1995, the Wyoming Bureau of Land Management (BLM) State Director is responsible for the development of standards for healthy rangelands and guidelines for livestock grazing management on 18 million acres of Wyoming's public rangelands. The development and application of these standards and guidelines are to achieve the four fundamentals of rangeland health outlined in the grazing regulations (43 Code of Federal Regulations [CFR] 4180.1). Those four fundamentals are: (1) watersheds are functioning properly; (2) water, nutrients, and energy are cycling properly; (3) water quality meets State standards; and (4) habitat for special status species is protected.

Standards address the health, productivity, and sustainability of the BLM-administered public rangelands and represent the minimum acceptable conditions for the public rangelands. The standards apply to all resource uses on public lands. Their application will be determined as use-specific guidelines are developed. Standards are synonymous with goals and are observed on a landscape scale. They describe healthy rangelands rather than important rangeland by-products. The achievement of a standard is determined by measuring appropriate indicators. An indicator is a component of a system whose characteristics (e.g., presence, absence, quantity, and distribution) can be measured based on sound scientific principles.

Guidelines provide for, and guide the development and implementation of, reasonable, responsible, and cost-effective management practices at the grazing allotment and watershed level. The guidelines in this document apply specifically to livestock grazing management practices on the BLM-administered public lands. These management practices will either maintain existing desirable conditions or move rangelands toward statewide standards within reasonable timeframes. Appropriate guidelines will ensure that the resultant management practices reflect the potential for the watershed, consider other uses and natural influences, and balance resource goals with social, cultural/historic, and economic opportunities to sustain viable local communities. Guidelines, like standards, apply statewide.

Quantifiable resource objectives and specific management practices to achieve the standards will be developed at the BLM Field Office level and will consider all reasonable and practical options available to achieve desired results on a watershed or grazing allotment scale. The objectives shall be reflected in site-specific activity or implementation plans as well as in livestock grazing permits/leases for the public lands. Interdisciplinary activity or implementation plans will be used to maintain or achieve the Wyoming standards for healthy rangelands. These plans may be developed formally or informally through mechanisms available and suited to local needs (such as Coordinated Resource Management [CRM] efforts).

The development and implementation of standards and guidelines will enable on-the-ground management of the public rangelands to maintain a clear and responsible focus on both the health of the land and its dependent natural and human communities. This development and implementation will ensure that any mechanisms currently being employed or that may be developed in the future will maintain a consistent focus on these essential concerns.

These standards and guidelines are compatible with BLM's three-tiered land use planning process. The first tier includes the laws, regulations, and policies governing BLM's administration and management of the public lands and their uses. The previously mentioned fundamentals of rangeland health specified in 43 CFR 4180.1, the requirement for BLM to develop these state (or regional) standards and guidelines, and the standards and guidelines themselves, are part of this first tier. Also part of this first tier are the specific requirements of various federal laws and the objectives of 43 CFR 4100.2 that require BLM to consider the social and economic well-being of the local communities in its management process.

These standards and guidelines will provide for statewide consistency and guidance in the preparation, amendment, and maintenance of BLM land use plans, which represent the second tier of the planning process. The BLM land use plans provide general allocation decisions concerning the kinds of resource and land uses that can occur on the BLM administered public lands, where they can occur, and the types of conditional requirements under which they can occur. In general, the standards will be the basis for development of planning area-specific management objectives concerning rangeland health and productivity, and the guidelines will direct development of livestock grazing management actions to help accomplish those objectives.

The third tier of the BLM planning process, activity or implementation planning, is directed by the applicable land use plan and, therefore, by the standards and guidelines. The standards and guidelines, as BLM statewide policy, will also directly guide development of the site-specific objectives and the methods and practices used to implement the land use plan decisions.

Activity or implementation plans contain objectives which describe the site-specific conditions desired. Grazing permits/leases for the public lands contain terms and conditions which describe specific actions required to attain or maintain the desired conditions. Through monitoring and evaluation, the BLM, grazing permittees, and other interested parties determine if progress is being made to achieve activity plan objectives.

Wyoming rangelands support a variety of uses which are of significant economic importance to the state and its communities. These uses include oil and gas production, mining, recreation and tourism, fishing, hunting, wildlife viewing, and livestock grazing. Rangelands also provide amenities which contribute to the quality of life in Wyoming such as open spaces, solitude, and opportunities for personal renewal. Wyoming's rangelands should be managed with consideration of the state's historical, cultural, and social development and in a manner which contributes to a diverse, balanced, competitive, and resilient economy in order to provide opportunity for economic development. Healthy rangelands can best sustain these uses.

To varying degrees, BLM management of the public lands and resources plays a role in the social and economic well-being of Wyoming communities. The National Environmental Policy Act (part of the above-mentioned first planning tier) and various other laws and regulations mandate the BLM to analyze the socioeconomic impacts of actions occurring on public rangelands. These analyses occur during the environmental analysis process of land use planning (second planning tier), where resource allocations are made, and during the environmental analysis process of activity or implementation planning (third planning tier). In many situations, factors that affect the social and economic well-being of local communities extend far beyond the scope of BLM management or individual public land users' responsibilities. In addition, since standards relate primarily to physical and biological features of the landscape, it is very difficult to provide measurable socioeconomic indicators that relate to the health of rangelands. It is important that standards be realistic and within the control of the land manager and users to achieve.

Implementation of the Wyoming standards and guidelines will generally be done in the following manner. Grazing allotments or groups of allotments in a watershed will be reviewed based on the BLM's current allotment categorization and prioritization process. Allotments with existing management plans and high-priority allotments will be reviewed first. Lower priority allotments will then be reviewed as time allows. The permittees and interested public will be notified when allotments are scheduled for review and are encouraged to participate in the review. The review will first determine if an allotment meets each of the six standards. If it does, no further action will be necessary. If any of the standards aren't being met, rationale explaining the contributing factors will be prepared. If livestock grazing practices are found to be among the contributing factors, corrective actions consistent with the guidelines will be developed and implemented. If a lack of data prohibits the reviewers from determining if a standard is being met, a strategy will be developed to acquire the data in a timely manner.

## **Standards for Healthy Public Rangelands**

### **Standard #1**

Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

This Means That:

The hydrologic cycle will be supported by providing for water capture, storage, and sustained release. Adequate energy flow and nutrient cycling through the system will be achieved as optimal plant growth occurs. Plant communities are highly varied within Wyoming.

Indicators May Include But Are Not Limited To:

- Water infiltration rates
- Soil compaction
- Erosion (rills, gullies, pedestals, capping)
- Soil micro-organisms
- Vegetative cover (gully bottoms and slopes)
- Bare ground and litter

### **Standard #2**

Riparian and wetland vegetation has structural, age, and species diversity characteristic of the stage of channel succession and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover, capture sediment, dissipate energy, and provide for groundwater recharge.

This Means That:

Wyoming has highly varied riparian and wetland systems on public lands. These systems vary from large rivers to small streams and from springs to large wet meadows. These systems are in various stages of natural cycles and may also reflect other disturbance that is either localized or

widespread throughout the watershed. Riparian vegetation captures sediments and associated materials, thus enhancing the nutrient cycle by capturing and utilizing nutrients that would otherwise move through a system unused.

Indicators May Include But Are Not Limited To:

- Erosion and deposition rate
- Channel morphology and floodplain function
- Channel succession and erosion cycle
- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bank stability
- Woody debris and instream cover
- Bare ground and litter

### **Standard #3**

Upland vegetation on each ecological site consists of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance.

This Means That:

In order to maintain desirable conditions and/or recover from disturbance within acceptable timeframes, plant communities must have the components present to support the nutrient cycle and adequate energy flow. Plants depend on nutrients in the soil and energy derived from sunlight. Nutrients stored in the soil are used over and over by plants, animals, and microorganisms. The amount of nutrients available and the speed with which they cycle among plants, animals, and the soil are fundamental components of rangeland health. The amount, timing, and distribution of energy captured through photosynthesis are fundamental to the function of rangeland ecosystems.

Indicators May Include But Are Not Limited To:

- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bare ground and litter
- Erosion (rills, gullies, pedestals, capping)
- Water infiltration rates

### **Standard #4**

Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened, endangered, species of special concern, or sensitive species will be maintained or enhanced.

This Means That:

The management of Wyoming rangelands will achieve or maintain adequate habitat conditions that support diverse plant and animal species. These may include listed threatened or endangered species (U.S. Fish and Wildlife-designated), species of special concern (BLM-designated), and other sensitive species (State of Wyoming-designated). The intent of this standard is to allow the listed species to recover and be delisted.

Indicators May Include But Are Not Limited To:

- Noxious weeds
- Species diversity
- Age class distribution
- All indicators associated with the upland and riparian standards
- Population trends
- Habitat fragmentation

#### **Standard #5**

Water quality meets State standards.

This Means That:

The State of Wyoming is authorized to administer the Clean Water Act. BLM management actions or use authorizations will comply with all federal and state water quality laws, rules and regulations to address water quality issues that originate on public lands. Provisions for the establishment of water quality standards are included in the Clean Water Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the Code of Federal Regulations and in Wyoming's Water Quality Rules and Regulations. The latter regulations contain Quality Standards for Wyoming Surface Waters.

Natural processes and human actions influence the chemical, physical, and biological characteristics of water. Water quality varies from place to place with the seasons, the climate, and the kind substrate through which water moves. Therefore, the assessment of water quality takes these factors into account.

Indicators May Include But Are Not Limited To:

- Chemical characteristics (e.g., pH, conductivity, dissolved oxygen)
- Physical characteristics (e.g., sediment, temperature, color)
- Biological characteristics (e.g., macro- and micro-invertebrates, fecal coliform, and plant and animal species)

**Standard #6**

Air quality meets State standards.

This Means That:

The State of Wyoming is authorized to administer the Clean Air Act. BLM management actions or use authorizations will comply with all federal and state air quality laws, rules, regulations and standards. Provisions for the establishment of air quality standards are included in the Clean Air Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the Code of Federal Regulations and in Wyoming Air Quality Standards and Regulations.

Indicators May Include But Are Not Limited To:

- Particulate matter
- Sulfur dioxide
- Photochemical oxidants (ozone)
- Volatile organic compounds (hydrocarbons)
- Nitrogen oxides
- Carbon monoxide
- Odors
- Visibility

**BLM Wyoming Guidelines for Livestock Grazing Management**

- I. Timing, duration, and levels of authorized grazing will ensure that adequate amounts of vegetative ground cover, including standing plant material and litter, remain after authorized use to support infiltration, maintain soil moisture storage, stabilize soils, allow the release of sufficient water to maintain system function, and to maintain subsurface soil conditions that support permeability rates and other processes appropriate to the site.
- II. Grazing management practices should restore, maintain, or improve riparian plant communities. Grazing management strategies consider hydrology, physical attributes, and potential for the watershed and the ecological site. Grazing management should maintain adequate residual plant cover to provide for plant recovery, residual forage, sediment capture, energy dissipation, and groundwater recharge.
- III. Range improvement practices (instream structures, fences, water troughs, etc.) in and adjacent to riparian areas will ensure that stream channel morphology (e.g., gradient, width/depth ratio, channel roughness and sinuosity) and functions appropriate to climate and landform are maintained or enhanced. The development of springs, seeps, or other projects affecting water and associated resources shall be designed to protect the ecological and hydrological functions, wildlife habitat, and significant cultural, historical, and archaeological values associated with the water source. Range improvements will be located away from riparian areas if they conflict with achieving or maintaining riparian function.

- IV. Grazing practices that consider the biotic communities as more than just a forage base will be designed in order to ensure that the appropriate kinds and amounts of soil organisms, plants, and animals to support the hydrologic cycle, nutrient cycle, and energy flow are maintained or enhanced.
- V. Continuous season-long or other grazing management practices that hinder the completion of plants' life-sustaining reproductive and/or nutrient cycling processes will be modified to ensure adequate periods of rest at the appropriate times. The rest periods will provide for seedling establishment or other necessary processes at levels sufficient to move the ecological site condition toward the resource objective and subsequent achievement of the standard.
- VI. Grazing management practices and range improvements will adequately protect vegetative cover and physical conditions and maintain, restore, or enhance water quality to meet resource objectives. The effects of new range improvements (water developments, fences, etc.) on the health and function of rangelands will be carefully considered prior to their implementation.
- VI- I. Grazing management practices will incorporate the kinds and amounts of use that will restore, maintain, or enhance habitats to assist in the recovery of federal threatened and endangered species or the conservation of federally-listed species of concern and other state-designated special status species. Grazing management practices will maintain existing habitat or facilitate vegetation change toward desired habitats. Grazing management will consider threatened and endangered species and their habitats.
- VI- II. Grazing management practices and range improvements will be designed to maintain or promote the physical and biological conditions necessary to sustain native animal populations and plant communities. This will involve emphasizing native plant species in the support of ecological function and incorporating the use of non-native species only in those situations in which native plant species are not available in sufficient quantities or are incapable of maintaining or achieving properly functioning conditions and biological health.
- IX. Grazing management practices on uplands will maintain desired plant communities or facilitate change toward desired plant communities.

## Definitions

**Activity Plans** – Allotment Management Plans (AMPs), Habitat Management Plans (HMPs), Watershed Management Plans (WMPs), Wild Horse Management Plans (WHMPs), and other plans developed at the local level to address specific concerns and accomplish specific objectives.

**Coordinated Resource Management (CRM)** – A group of people working together to develop common resource goals and resolve natural resource concerns. CRM is a people process that strives for win-win situations through consensus-based decision making.

**Desired Plant Community** – A plant community which produces the kind, proportion, and amount of vegetation necessary for meeting or exceeding the land use plan/activity plan objectives established for an ecological site(s). The desired plant community must be consistent with the site's capability to produce the desired vegetation through management, land treatment, or a combination of the two.

**Ecological Site** – An area of land with specific physical characteristics that differs from other areas both in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.

**Erosion** – (v.) Detachment and movement of soil or rock fragments by water, wind, ice, or gravity. (n.) The land surface worn away by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

**Grazing Management Practices** – Grazing management practices include such things as grazing systems (rest-rotation, deferred rotation, etc.), timing and duration of grazing, herding, salting, etc. They do not include physical range improvements.

**Guidelines (For Grazing Management)** – Guidelines provide for, and guide the development and implementation of, reasonable, responsible, and cost-effective management actions at the allotment and watershed level which move rangelands toward statewide standards or maintain existing desirable conditions. Appropriate guidelines will ensure that the resultant management actions reflect the potential for the watershed, consider other uses and natural influences, and balance resource goals with social, cultural/historic, and economic opportunities to sustain viable local communities. Guidelines, and, therefore, the management actions they engender, are based on sound science, past and present management experience, and public input.

**Indicator** – An indicator is a component of a system whose characteristics (e.g., presence, absence, quantity, and distribution) can be measured based on sound scientific principles. An indicator can be measured (monitored and evaluated) at a site- or species-specific level. Measurement of an indicator must be able to show change within timeframes acceptable to management and be capable of showing how the health of the ecosystem is changing in response to specific management actions. Selection of the appropriate indicators to be monitored in a particular allotment is a critical aspect of early communication among the interests involved on the ground. The most useful indicators are those for which change or trend can be easily quantified and for which agreement as to the significance of the indicator is broad based.

**Litter** – The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material.



**Management Actions** – Management actions are the specific actions prescribed by the BLM to achieve resource objectives, land use allocations, or other program or multiple use goals. Management actions include both grazing management practices and range improvements.

**Objective** – An objective is a site-specific statement of a desired rangeland condition. It may contain qualitative (subjective) elements, but it must have quantitative (objective) elements so that it can be measured. Objectives frequently speak to change. They may measure the avoidance of negative changes or the accomplishment of positive changes. They are the focus of monitoring and evaluation activities at the local level. Objectives may measure the products of an area rather than its ability to produce them, but if they do so, it must be kept in mind that the lack of a product may not mean that the standards have not been met. Instead, the lack of a particular product may reflect other factors such as political or social constraints. Objectives often focus on indicators of greatest interest for the area in question.

**Range Improvements** – Range improvements include such things as corrals, fences, water developments (reservoirs, spring developments, pipelines, wells, etc.) and land treatments (prescribed fire, herbicide treatments, mechanical treatments, etc.).

**Rangeland** – Land on which the native vegetation (climax or natural potential) is predominantly grasses, grass-like plants, forbs, or shrubs. This includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangelands include natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

**Rangeland Health** – The degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained.

**Riparian** – An area of land directly influenced by permanent water. It has visible vegetation or physical characteristics reflective of permanent water influence. Lakeshores and streambanks are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not have vegetation dependent on free water in the soil.

**Standards** – Standards are synonymous with goals and are observed on a landscape scale. Standards apply to rangeland health and not to the important by-products of healthy rangelands. Standards relate to the current capability or realistic potential of a specific site to produce these by-products, not to the presence or absence of the products themselves. It is the sustainability of the processes, or rangeland health, that produces these by-products.

**Terms and Conditions** – Terms and conditions are very specific land use requirements that are made a part of the land use authorization in order to assure maintenance or attainment of the standard. Terms and conditions may incorporate or reference the appropriate portions of activity plans (e.g., Allotment Management Plans). In other words, where an activity plan exists that contains objectives focused on meeting the standards, compliance with the plan may be the only term and condition necessary in that allotment.

**Upland** – Those portions of the landscape which do not receive additional moisture for plant growth from run-off, streamflow, etc. Typically these are hills, ridgetops, valley slopes, and rolling plains.

## Appendix K. Livestock Grazing Allotments and Range Improvements

This appendix provides an overview of livestock grazing allotments including acreage and season of use; allotment categorization; and allotments assessed for standards and guidelines. In addition, it provides details of range improvement projects. The data are presented in five tables:

- Table K.1, “Grazing Allotments, Acres, Season of Use, and Animal Unit Months” (p. 1448)
- Table K.2, “Allotment Categorization – Current and Proposed” (p. 1460)
- Table K.3, “Lander Field Office Grazing Allotments Assessed for Meeting Standards” (p. 1467)
- Table K.4, “Allotment Management Plans and Rangeland Management Agreements Developed” (p. 1469)
- Table K.5, “Summary of Range Improvements Lander Field Office, 1986-2009” (p. 1471)
- Table K.6, “Animal Unit Months Authorized, 1989-2008” (p. 1476)

In 1985, the Bureau of Land Management (BLM) established three categories for allotments to identify areas where management was needed, as well as to prioritize workloads and the use of range improvement dollars generated from the portion of grazing fees returned to the field office. See Chapter 4, *Fire and Fuels Management* for changes in the use of range improvement dollars. The categories and criteria used to place an allotment into each category are described below. Subsequently, in 2008, the BLM revised the definitions for these categories in Instruction Memorandum (IM) 2009–018, *Process for Setting Priorities for Issuing Grazing Permits and Leases*. The guidance makes clear that categorization is not done as part of a Resource Management Plan (RMP) revision and does not require an RMP amendment or maintenance action. However, part of the National Environmental Policy Act (NEPA) process associated with the RMP and Environmental Impact Statement (EIS) is to engage the public in scoping and providing input on management decisions. Accordingly, this appendix identifies information on grazing allotments to better inform the public on livestock grazing management on the allotment level. Any allotment specific decisions beyond analyzing closing as much as 12,839 acres to public grazing, would be analyzed on a site-specific basis as the procedures required by IM 2009–018 are implemented.

The categorization process now emphasizes ensuring that land health considerations are the primary basis for prioritizing the processing and issuing of grazing authorizations for use of allotments on public lands. A flow chart for the process of issuing grazing permits and leases establishes the process to be followed as outlined in IM 2009–018.

**Category I** – Allotments where current livestock grazing management or level of use on public land is, or is expected to be, a significant causal factor in the non-achievement of land health standards, or where a change in mandatory terms and conditions in the grazing authorization is or may be necessary. When identifying Category I allotments, review condition of critical habitat, conflicts with greater sage-grouse, and whether projects have been proposed specifically for implementing the Healthy Lands Initiative.

**Category M** – Allotments where land health standards are met or where livestock grazing on public land is not a significant causal factor for not meeting the standards and current livestock management is in conformance with guidelines developed by the State Directors in consultation with Resource Advisory Councils. Allotments where an evaluation of land health standards has not been completed, but existing monitoring data indicates that resource conditions are satisfactory.

**Category C** – Allotments where public lands produce less than 10 percent of the forage in the allotment or are less than 10 percent of the land area. An allotment should generally not be designated Category C if the public land in the allotment contains: (1) critical habitat for a threatened or endangered species, and/or (2) riparian-wetlands adversely affected by livestock grazing.

**Table K.1. Grazing Allotments, Acres, Season of Use, and Animal Unit Months**

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
180	Lost Creek	238	Permit – Sec 3	Cattle	6/15 – 9/25	21
655	Copper Mountain	248	Permit – Sec 3	Cattle	6/1 – 11/15	121
1301	Cantril Jack Allotment	6,875	Permit – Sec 3	Cattle	8/16 – 11/30	573
1302	North of CB&Q Railroad	961	Permit – Sec 3	Cattle	3/5 – 5/4	160
1303	South of CB&Q Railroad	7,256	Permit – Sec 3	Cattle	3/5 – 5/4	660
				Cattle	10/20 – 12/16	
				Cattle	11/15 – 12/16	
1304	Crawford Creek	1,209	Permit – Sec 3	Cattle	6/15 – 10/14	460
1305	Lybyer North	3,175	Permit – Sec 3	Cattle	4/26 – 5/31	262
1306	Canning Allotment	347	Permit – Sec 3	Cattle	8/10 – 2/28	28
				Cattle	3/1 – 5/1	
				Horse	3/1 – 2/28	
1307	Mallet-Smith Pasture	137	Permit – Sec 3	Cattle	7/1 – 9/30	24
1308	167A Scott-Robson	283	Permit – Sec 3	Cattle	5/1 – 6/15	33
				Cattle	10/15 – 12/17	
				Sheep	5/1 – 6/15	
				Sheep	10/15 – 12/17	
1309	Logan Pasture	3,427	Permit – Sec 3	Cattle	6/1 – 9/15	610
1310	Cottonwood Pass	2,321	Permit – Sec 3	Cattle	10/18 – 11/1	249
				Cattle	6/1 – 6/15	
1311	Keenan	191	Permit – Sec 3	Cattle	4/30 – 5/30	16
1312	North of Tracks	15,556	Permit – Sec 3	Cattle	2/14 – 6/15	2,820
				Cattle	10/1 – 12/31	
				Horse	3/1 – 2/28	
1313	South of Tracks	8,923	Permit – Sec 3	Cattle	4/1 – 12/31	1,110
1314	Moneta Hills Pasture	7,752	Permit – Sec 3	Cattle	4/1 – 12/31	587

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1315	Ditch Pasture	782	Permit – Sec 3	Cattle	4/20 – 5/5	108
1316	Madden Ranch Pasture	1,442	Permit – Sec 3	Cattle	5/5 – 12/30	170
1317	Brandau Ranch Allotment	309	Permit – Sec 3	Cattle	8/15 – 12/31	167
1318	Below the Hill Pasture	2,793	Permit – Sec 3	Cattle	6/1 – 9/29	78
1319	Twidale	200	Permit – Sec 3	Cattle	5/1 – 5/31	39
				Cattle	10/1 – 10/31	
				Horse	11/1 – 2/28	
1320	St. Clair West	350	Permit – Sec 3	Cattle	4/10 – 5/10	65
1321	St. Clair Ranch	141	Permit – Sec 3	Cattle	11/15 – 2/28	89
				Cattle	3/1 – 3/31	
1322	St. Clair South Pasture	4,435	Permit – Sec 3	Horse	5/1 – 1/15	726
				Cattle	10/15 – 12/31	
1323	Fuller Allotment	3,050	Permit – Sec 3	Cattle	8/7 – 10/28	413
				Cattle	5/24 – 6/25	
1324	Hoodoo Creek Allotment	23,168	Permit – Sec 3	Cattle	9/1 – 10/10	1,491
				Cattle	1/6 – 6/26	
1325	East of Ranch	3,033	Permit – Sec 3	Cattle	12/1 – 5/31	236
				Sheep	12/1 – 6/15	
1326	Lichtenstein	5,998	Permit – Sec 3	Cattle	1/1 – 2/28	501
				Sheep	12/1 – 4/15	
1327	Myrtle Reed Allotment	1,213	Permit – Sec 3	Cattle	5/1 – 10/31	72
1328	Battle Axe South	6,994	Permit – Sec 3	Cattle	5/1 – 9/12	552
1329	Lysite Mountain <sub>1</sub>	8,192	Permit – Sec 3	Cattle	5/10 – 11/1	2,569
				Horse	6/1 – 5/31	
1330	Battle Axe Lysite <sub>1</sub>	3,717	Permit – Sec 3	Sheep	3/19 – 4/20	420
				Cattle	8/15 – 10/1	
				Cattle	4/15 – 6/1	
1331	Battle Axe Berger <sub>1</sub>	8,537	Permit – Sec 3	Cattle	5/16 – 4/30	911
				Horse	3/1 – 2/28	
1332	Bow & Arrow	1,094	Permit – Sec 3	Cattle	4/10 – 6/15	159
				Cattle	10/1 – 12/1	
				Horse	6/1 – 9/30	
1333	Gates Draw Allotment	12,793	Permit – Sec 3	Cattle	11/1 – 5/31	1,490
1334	Cottonwood Pass	3,890	Permit – Sec 3	Cattle	6/11 – 10/20	825
1335	OCLA South of Railroad	6,848	Permit – Sec 3	Cattle	12/1 – 3/31	912
1336	OCLA North of Railroad	5,600	Permit – Sec 3	Cattle	4/20 – 5/30	425
1337	De Pass Ranch	528	Permit – Sec 3	Cattle	3/1 – 2/28	125

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1338	Fuller Ranch Pasture	1,450	Permit – Sec 3	Cattle	3/1 – 4/30	165
1339	Picard Private Allotment	3,146	Permit – Sec 3	Cattle	12/1 – 5/15	490
1340	168A North of Seeps	796	Permit – Sec 3	Cattle	9/20 – 12/1	200
				Cattle	5/1 – 6/1	
				Horse	6/1 – 9/30	
1341	168 A Stock Driveway <sub>1</sub>	2,016	Permit – Sec 3	Cattle	12/1 Permit – Sec 312/31	40
				Horse	12/1 – 12/31	
1342	Knapp Individual	997	Permit – Sec 3	Cattle	10/10 – 11/15	40
1343	Tuff Creek Pasture	15,728	Permit – Sec 3	Cattle	11/16 – 2/28	860
				Cattle	4/1 – 7/31	
1344	Westfall	3,620	Permit – Sec 3	Horse	3/1 – 12/20	698
				Cattle	6/1 – 2/28	
1345	Mountain Pasture	1,135	Permit – Sec 3	Cattle	5/20 – 1/15	277
1346	Bonneville Reservoir	10,968	Permit – Sec 3	Cattle	4/15 – 6/10	984
				Horse	4/15 – 6/10	
				Cattle	10/1 – 12/31	
1347	Jones Creek Basin	1,292	Permit – Sec 3	Cattle	7/1 – 10/10	488
1348	J. Herbst Summer	2,198	Permit – Sec 3	Cattle	6/1 – 9/30	308
				Horse	10/1 – 4/30	
1349	J. Herbst Tuff Creek	1,226	Permit – Sec 3	Cattle	10/1 – 11/15	228
				Cattle	5/1 – 5/30	
1350	Wm. Herbst Summer	885	Permit – Sec 3	Cattle	10/15 – 12/15	60
1351	Scott Draw	3,386	Permit – Sec 3	Cattle	10/1 – 11/7	303
1352	Joe Johns Pasture	1,109	Permit – Sec 3	Cattle	8/15 – 11/30	298
				Sheep	6/1 – 10/1	
1353	Campbell	2,843	Permit – Sec 3	Cattle	5/13 – 11/30	299
				Horse	4/15 – 1/1	
				Sheep	5/15 – 7/15	
				Sheep	9/1 – 12/10	
1354	Stinking Well	10,009	Permit – Sec 3	Sheep	3/1 – 4/15	789
				Sheep	5/15 – 6/15	
				Cattle	3/1 – 5/31	
				Cattle	12/1 – 2/28	
				Sheep	12/1 – 2/28	
1355	Lookout Hill	7,942	Permit – Sec 3	Sheep	4/1 – 6/28	682
				Sheep	10/20 – 12/10	
				Cattle	4/1 – 5/15	
1356	Howard Pasture	2,717	Permit – Sec 3	Cattle	1/1 – 2/28	224
				Sheep	4/1 – 7/31	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
				Sheep	12/15 – 2/28	
1357	Summer Allotment	182	Permit – Sec 3	Cattle	6/15 – 7/14	32
1358	Top of Mountain Past	910	Permit – Sec 3	Cattle	6/15 – 10/15	23
1359	Ramage Ranch	11,990	Permit – Sec 3	Horse	3/1 – 2/28	1,549
				Cattle	11/1 – 6/20	
1360	Ruth Fuller Private	86	Permit – Sec 3	Cattle	5/15 – 5/23	9
				Cattle	6/26 – 8/6	
1361	Copper Mountain (Lander)	288	Permit – Sec 3	Cattle	7/1 – 9/30	40
1362	Lybyer South	2,500	Permit – Sec 3	Cattle	3/1 – 4/30	319
				Cattle	10/15 – 11/30	
1363	Hoodoo HQ Pastures	86	Permit – Sec 3	Cattle	3/1 – 2/28	4
				Horse	3/1 – 2/28	
1364	Red Ranch Pasture	24	Permit – Sec 3	Cattle	3/1 – 2/28	1
1365	Quien Sabe Ranch Pasture	5,973	Permit – Sec 3	Cattle	4/1 – 6/30	944
				Cattle	10/1 – 11/15	
1366	Cabin Pasture	265	Permit – Sec 3	Cattle	3/1 – 2/28	65
				Horse	5/1 – 11/30	
				Sheep	3/1 – 2/28	
1367	Henrich Pasture	81	Permit – Sec 3	Cattle	5/15 – 11/1	11
1368	Bridger Creek	114	Permit – Sec 3	Cattle	3/1 – 2/28	18
				Horse	3/1 – 2/28	
1369	Picard Ranch HQ	191	Permit – Sec 3	Cattle	3/1 – 2/28	17
1373	Copper Mountain	277	Permit – Sec 3	Cattle	6/1 – 10/15	16
1401	Rim Pasture <sub>1</sub>	19,100	Permit – Sec 3	Cattle	6/1 – 10/31	3,982
				Sheep	6/1 – 10/8	
1402	Delfelder Allotment	8,938	Permit – Sec 3	Cattle	3/1 – 1/17	1,203
1403	Conant Creek Common <sub>1</sub>	49,541	Permit – Sec 3	Sheep	12/16 – 4/15	7,987
				Cattle	5/1 – 11/30	
				Sheep	5/1 – 6/15	
				Sheep	10/14 – 11/30	
1404	Wm. Herbst Winter	2,932	Permit – Sec 3	Cattle	4/6 – 6/20	398
				Cattle	11/1 – 12/31	
1405	Posey North Allotment	4,410	Permit – Sec 3	Cattle	4/15 – 6/20	429
				Cattle	11/1 – 12/15	
1406	Poison Creek	16,759	Permit – Sec 3	Cattle	3/15 – 6/15	817
				Cattle	10/15 – 12/30	
1407	Muskrat Amp	39,494	Permit – Sec 3	Cattle	10/15 – 4/30	3,962

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1408	Township Pasture	18,904	Permit – Sec 3	Cattle	10/1 – 1/15	2,478
				Horse	11/1 – 2/28	
				Horse	3/1 – 4/30	
				Cattle	4/1 – 4/30	
1409	Muskrat Open <sub>1</sub>	99,243	Permit – Sec 3	Cattle	5/1 – 11/30	10,519
1410	Posey Pasture	1,061	Permit – Sec 3	Cattle	4/22 – 5/20	165
1411	Shoshoni Road	21,158	Permit – Sec 3	Cattle	3/1 – 1/17	2,706
				Horse	3/1 – 2/28	
1412	Poston Winter	3,552	Permit – Sec 3	Cattle	3/1 – 2/28	437
1413	Pipeline Pasture	4,228	Permit – Sec 3	Horse	12/1 – 4/30	452
				Cattle	12/1 – 5/4	
1414	Anderson Winter	5,864	Permit – Sec 3	Cattle	11/1 – 1/2	770
				Cattle	5/15 – 5/31	
1415	Myers Pasture	903	Permit – Sec 3	Cattle	5/1 – 9/15	116
1416	Lame Jack Draw	6,373	Permit – Sec 3	Cattle	5/1 – 9/30	720
1417	Haybarn Hill	9,947	Permit – Sec 3	Cattle	11/1 – 4/30	1,195
1512	South Dobie Flat	6,847	Permit – Sec 3	Cattle	5/23 – 6/9	1,207
				Cattle	10/25 – 12/6	
1518	Little Bug Pasture	3,837	Permit – Sec 3	Cattle	1/1 – 4/1	564
1601	Dodds Allotment	1,744	Permit – Sec 3	Sheep	5/1 – 10/30	446
1604	#17 Horse Heaven Pasture	16,329	Permit – Sec 3	Horse	6/1 – 9/30	3,077
				Cattle	6/15 – 10/19	
				Sheep	7/1 – 10/18	
1605	#18 Horse Creek Pasture	3,685	Permit – Sec 3	Sheep	5/1 – 6/15	459
				Sheep	10/19 – 11/30	
				Cattle	10/20 – 11/16	
1606	#19 Vinegar Hill Pasture	6,662	Permit – Sec 3	Sheep	10/19 – 12/12	981
				Horse	1/1 – 3/31	
				Cattle	11/18 – 12/24	
				Sheep	12/30 – 1/15	
1607	#16 Phillips Pasture	1,872.00	Permit – Sec 3	Sheep	1/16 – 4/15	259
				Cattle	12/25 – 2/8	
1608	#20 Calf Pasture	828	Permit – Sec 3	Cattle	5/1 – 6/15	130
				Sheep	5/1 – 6/15	
1609	#21 Horse Pasture	1,143	Permit – Sec 3	Horse	4/1 – 5/31	168
				Cattle	6/1 – 6/6	
			Permit – Sec 3	Sheep	6/16 – 6/30	
1610	#22 Bull Pasture	908	Permit – Sec 3	Cattle	4/1 – 6/30	156
				Sheep	5/1 – 6/15	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1612	Hamilton Rock Pasture	3,998	Permit – Sec 3	Cattle	12/25 – 1/27	454
				Sheep	1/16 – 4/15	
1614	Circle Bar Allotment	38,299	Permit – Sec 3	Horse	5/1 – 2/28	5,897
				Cattle	5/1 – 2/28	
1615	North of Drift Fence	20,318	Permit – Sec 3	Cattle	6/10 – 9/26	4,391
1616	Keester	29,779		Horse	11/15 – 12/5	4,582
			Permit – Sec 3	Cattle	5/16 – 11/28	
1619	Winter Pastures (incl. Clayto 1618)	17,569	Permit – Sec 3	Cattle	9/26 – 5/15	2,635
				Horse	12/6 – 6/30	
1620	Cabin Creek Pasture	1,153	Permit – Sec 3	Cattle	7/10 – 10/26	241
1622	Hat Ranch	5,022	Permit – Sec 3	Cattle	3/1 – 5/15	855
				Horse	3/1 – 5/15	
				Cattle	12/1 – 2/28	
				Horse	11/1 – 2/28	
1623	Murphree Pastures	9,219	Permit – Sec 3	Horse	6/25 – 11/16	1,061
				Cattle	3/1 – 11/30	
1625	Jamerman Pastures	6,603	Permit – Sec 3	Cattle	3/1 – 5/19	478
				Cattle	11/1 – 2/28	
1626	Mud Lake	1,324	Permit – Sec 3	Cattle	12/1 – 12/31	113
1628	Sage Hen	1,312	Permit – Sec 3	Cattle	12/1 – 2/28	189
1629	JJ Winter Pastures	721	Permit – Sec 3	Cattle	3/1 – 4/30	276
				Horse	3/1 – 2/28	
				Cattle	11/1 – 2/28	
1630	Tram Road Pasture	1,136	Permit – Sec 3	Cattle	4/1 – 5/15	135
1631	Claytor Homestead	59	Permit – Sec 3	Cattle	3/1 – 3/31	6
1632	North Hat Pasture	1,144	Permit – Sec 3	Cattle	3/15 – 4/30	180
				Horse	6/1 – 8/31	
1633	Stampede Bog	552	Permit – Sec 3	Cattle	3/1 – 4/30	89
				Cattle	10/15 – 11/30	
1635	Big Rock Pasture	13,386	Permit – Sec 3	Cattle	4/1 – 5/31	1,995
				Cattle	10/15 – 11/26	
1636	Granite Mtn. Open <sub>1</sub>	77,746	Permit – Sec 3	Cattle	5/10 – 10/31	12,584
1638	Winter Allotment	160	Permit – Sec 3	Cattle	3/1 – 3/31	16
1640	Garson Ranch	2,531	Lease – Sec 15	Cattle	6/1 – 10/31	403
1642	Devils Gate	24,227	Permit – Sec 3	Cattle	3/1 – 2/28	3,700
				Horse		
1644	Turkey Track Ranch	9,057	Permit – Sec 3	Cattle	3/1 – 2/28	1,832
				Horse		



Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1660	Home, North of Highway	1,231	Permit – Sec 3	Cattle	12/1 – 5/25	205
				Horse	3/1 – 5/25	
1701	Flagg Amp <sub>1</sub>	11,463	Permit – Sec 3	Cattle	5/1 – 11/30	2,086
1702	Flagg Individual	298	Permit – Sec 3	Cattle	12/1 – 2/28	51
1703	Big Pasture <sub>1</sub>	76,090	Permit – Sec 3	Cattle	5/1 – 11/7	11,909
1704	Breeding Pasture <sub>1</sub>	16,916	Permit – Sec 3	Cattle	4/3 – 6/8	1,956
				Cattle	9/1 – 11/16	
				Horse	4/1 – 12/15	
1705	Myers Fenced Pasture	1,640	Permit – Sec 3	Cattle	4/6 – 4/30	175
1706	Trent and Home Place	427	Permit – Sec 3	Cattle	11/16 – 2/28	40
1707	Ice Slough	953	Permit – Sec 3	Cattle	5/1 – 7/31	183
1709	Long Creek Pasture	2,567	Permit – Sec 3	Cattle	4/1 – 9/30	227
				Cattle	11/16 – 12/15	
1710	Graham Ranch Pasture	1,129	Permit – Sec 3	Cattle	11/15 – 2/28	175
				Cattle	3/1 – 4/30	
1711	Hay Meadow Pasture	316	Permit – Sec 3	Cattle	3/1 – 5/14	50
				Cattle	9/1 – 2/28	
1712	Long Creek Sweetwater	426	Permit – Sec 3	Cattle	11/1 – 4/30	66
1713	Whitlock Fenced	1,057	Permit – Sec 3	Cattle	4/1 – 4/30	126
1714	Scarlett Pasture	41	Permit – Sec 3	Cattle	10/1 – 2/28	79
1715	Horse Pasture	130	Permit – Sec 3	Horse	3/1 – 3/31	14
				Horse	12/16 – 2/28	
1716	Dishpan Butte <sub>1</sub>	16,069	Permit – Sec 3	Cattle	5/15 – 11/1	1,983
1717	Fenced Individual	1,310	Permit – Sec 3	Cattle	5/1 – 6/14	171
1801	East Beaver Common <sub>1</sub>	61,911	Permit – Sec 3	Cattle	5/1 – 11/15	7,331
1802	Sand Draw Amp	13,635	Permit – Sec 3	Cattle	6/1 – 10/15	1,418
1803	Government Draw <sub>1</sub>	75,775	Permit – Sec 3	Cattle	5/7 – 10/31	8,940
1804	Government Draw-Lower Beaver <sub>1</sub>	20,468	Permit – Sec 3	Cattle	3/1 – 6/10	4,040
				Cattle	11/1 – 2/28	
1805	Kirby-Reservation Boundary	5,265	Permit – Sec 3	Cattle	5/16 – 6/14	734
				Cattle	11/1 – 11/30	
1806	Griffin Beaver Creek	6,087	Permit – Sec 3	Cattle	5/1 – 10/15	714
1807	Baldwin Pasture	465	Permit – Sec 3	Cattle	4/20 – 5/15	105

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
1808	Hudson Draw Private Allotment	481	Permit – Sec 3	Cattle	5/7 – 6/14	38
1809	Bringolf Ranch	668	Permit – Sec 3	Cattle	4/15 – 5/14	141
				Cattle	10/1 – 10/31	
1810	Yellowstone Ranch	338	Permit – Sec 3	Cattle	11/1 – 12/31	92
1813	Blue Ridge	260	Permit – Sec 3	Cattle	11/1 – 12/16	8
1814	Highway Pasture	152	Permit – Sec 3	Cattle	5/1 – 5/29	21
1901	Atlantic City Common <sub>1</sub>	38,698	Permit – Sec 3	Cattle	5/20 – 9/30	4,765
				Cattle	5/8 – 10/4	
				Goat	5/20 – 9/30	
1902	Cottonwood Basin	7,625	Permit – Sec 3	Horse	5/1 – 9/30	705
				Cattle	4/20 – 10/31	
1903	Silver Creek Common <sub>1</sub>	32,941	Permit – Sec 3	Cattle	5/15 – 10/31	3,524
1904	Devils Canyon Amp <sub>1</sub>	3,585	Permit – Sec 3	Cattle	5/16 – 9/30	652
1905	Ellis Upper Beaver <sub>1</sub>	2,105	Permit – Sec 3	Cattle	5/16 – 9/30	530
1906	Twin Creek Individual	7,516	Permit – Sec 3	Cattle	5/1 – 12/1	1,644
				Horse	5/2 – 7/1	
1907	Commissary Hill	953	Permit – Sec 3	Cattle	6/1 – 6/15	74
				Cattle	10/1 – 10/15	
1908	Little Popo Agie Amp	8,541	Permit – Sec 3	Cattle	5/10 – 10/1	1,814
1909	Onion Flat	1,193	Permit – Sec 3	Cattle	5/1 – 5/31	188
				Cattle	10/16 – 11/15	
1910	Sawmill Basin	2,401	Permit – Sec 3	Cattle	6/1 – 10/15	197
1911	Red Canyon Amp <sub>1</sub>	3,605	Permit – Sec 3	Cattle	5/15 – 8/28	580
1912	Twin Creek Private	385	Permit – Sec 3	Cattle	5/16 – 10/15	44
1913	McGraw Flat Individual	1,034	Permit – Sec 3	Cattle	6/1 – 9/30	206
1914	McGraw Flat Common <sub>1</sub>	10,401	Permit – Sec 3	Cattle	5/1 – 10/31	1,824
1915	Beaver Amp	8,958	Permit – Sec 3	Cattle	5/1 – 10/31	1,964
1916	Hall CK Individual	12,464	Permit – Sec 3	Cattle	5/1 – 1/31	2,328
				Horse	5/15 – 2/28	
1917	Cottonwood Divide	5,685	Permit – Sec 3	Cattle	6/1 – 7/10	1,570
				Cattle	10/1 – 11/14	
1918	McGraw Flat-U. Beaver	8,388	Permit – Sec 3	Cattle	7/1 – 10/10	1,146
1919	Gravel Springs <sub>1</sub>	2,840	Permit – Sec 3	Cattle	5/16 – 10/10	488
1920	Salisbury Amp	5,389	Permit – Sec 3	Cattle	5/16 – 9/30	996

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
				Horse	5/16 – 9/30	
1921	Level Meadows	3,249	Permit – Sec 3	Cattle	6/1 – 10/30	701
1922	French George Crossing	626	Permit – Sec 3	Cattle	5/16 – 9/30	146
1923	Atlantic City Upper Fenced	248	Permit – Sec 3	Cattle	5/1 – 11/30	81
1924	Atlantic City Lower Fenced	127	Permit – Sec 3	Cattle	5/1 – 11/30	58
1925	Hall Creek Winter Pasture <sub>1</sub>	1,299	Permit – Sec 3	Cattle	11/23 – 2/28	98
1926	McKinney Individual	818	Permit – Sec 3	Cattle	5/1 – 9/30	235
1927	Upper Ellis Ranch	236	Permit – Sec 3	Cattle	9/15 – 12/31	157
1928	Lower Ellis Ranch	321	Permit – Sec 3	Cattle	9/15 – 12/31	48
1929	Barras Spring	51	Not Licensed			
1930	Long Willow	709	Not Licensed			
1931	Woolery Individual	1,231	Not Licensed			
1932	Sheep Mountain	558	Permit – Sec 3	Cattle	6/1 – 9/30	99
1933	Lazy Y	173	Not Licensed			
1934	Red Canyon Rim	846	Permit – Sec 3	Cattle	6/5 – 10/31	29
1935	Bowman Ranch		Not Licensed			
1936	Derby		Not Licensed			
1937	Little Knoll		Not Licensed			
1938	Bergstedt Ranch	52	Not Licensed			
1939	Auer Ranch	649	Permit – Sec 3	Cattle	11/1 – 2/28	93
1940	Henton Ranch	24	Not Licensed			
1941	Flat Onion		Not Licensed			
1943	Red Bluff Creek	89	Permit – Sec 3	Cattle	3/1 – 2/28	1
				Cattle	6/1 – 9/30	
2009	Alkali Pasture	444	Permit – Sec 3	Cattle	5/1 – 6/30	28
				Cattle	8/1 – 10/31	
2011	Highway Allotment	509	Permit – Sec 3	Cattle	4/1 – 5/15	90
2021	Willow Creek Allotment	85	Permit – Sec 3	Cattle	5/1 – 6/30	15
2023	Crooks Gap	952	Permit – Sec 3	Cattle	10/1 – 11/30	83
2025	Leckinby Pasture	3,436	Permit – Sec 3	Cattle	5/1 – 11/30	607
2026	Little Camp Creek	2,281	Permit – Sec 3	Cattle	5/1 – 10/31	294
2028	Mitchell Pasture	544	Permit – Sec 3	Cattle	6/15 – 9/15	106
2029	Diamond Hook	141	Permit – Sec 3	Cattle	3/1 – 2/28	27
2103	Lime Kiln Gulch	1,159	Lease – Sec 15	Cattle	5/15 – 6/30	154

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
2104	Little Warm Springs Canyon	315	Not Licensed	Cattle	9/25 – 9/28	27
2106	Fire Ridge	148	Lease – Sec 15	Horse	6/15 – 9/30	8
2107	Wells 11	305	Lease – Sec 15	Horse	5/1 – 6/30	31
				Horse	8/1 – 10/31	
2108	Geyser Creek	829	Lease – Sec 15	Horse	6/1 – 9/30	50
2109	Cross 14	643	Lease – Sec 15	Cattle	6/1 – 9/30	134
2110	Little Horse Creek	720	Lease – Sec 15	Horse	5/15 – 10/31	51
2111	E A Mountain 16	1,761	Lease – Sec 15	Cattle	6/1 – 6/30	264
				Cattle	8/1 – 10/30	
2112	Bear Creek No. 2112	3,499	Lease – Sec 15	Cattle	5/1 – 6/30	542
				Cattle	10/15 – 11/30	
2113	Crooked Creek	1,247	Lease – Sec 15	Cattle	6/25 – 9/30	133
				Horse	6/25 – 10/28	
2114	Spence 23	1,470	Lease – Sec 15	Cattle	5/1 – 12/1	290
2115	Hat Butte	893	Lease – Sec 15	Cattle	6/1 – 6/30	154
				Cattle	9/1 – 10/30	
2116	Elk Ridge Southeast	316	Lease – Sec 15	Horse	6/1 – 8/31	21
2117	Blue Holes	682	Lease – Sec 15	Horse	3/1 – 4/30	90
				Horse	11/1 – 2/28	
2119	White Pass 31	650	Lease – Sec 15	Cattle	5/1 – 6/30	116
				Cattle	10/1 – 11/30	
2120	Windy Ridge	332	Lease – Sec 15	Cattle	4/1 – 6/30	54
				Cattle	10/1 – 10/31	
2121	Mason Drawn	6,813	Lease – Sec 15	Cattle	5/1 – 6/30	845
				Cattle	10/1 – 10/30	
2122	Tappan Creek 34	1,065	Lease – Sec 15	Cattle	6/1 – 11/15	180
2123	Batrum Mountain	5,936	Lease – Sec 15	Cattle	6/1 – 10/15	531
2125	Albright 47	286	Lease – Sec 15	Horse	4/1 – 6/30	28
				Horse	10/1 – 10/31	
2126	CM 49	940	Lease – Sec 15	Horse	11/10 – 12/9	67
				Horse	6/1 – 6/30	
2127	Wagon Gulch	80	Lease – Sec 15	Cattle	6/15 – 12/15	95
				Horse	6/15 – 12/15	
2128	Bitterroot 60	691	Lease – Sec 15	Horse	5/20 – 6/17	68
2130	Cross 67		Lease – Sec 15	Cattle	5/1 – 9/30	91
2132	Stoney Point 73	591	Lease – Sec 15	Horse	3/1 – 6/1	12
		121		Horse	10/15 – 2/28	
2201	North Fork Rim		Lease – Sec 15	Cattle	6/1 – 10/31	60
2202	Baldwin Creek School	1,959	Lease – Sec 15	Horse	5/1 – 7/1	16
2203	Madison Creek	1,656	Lease – Sec 15	Horse	5/1 – 11/30	20
		282		Cattle	5/1 – 11/30	

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
2204	Table Mountain 9	1,216	Lease – Sec 15	Cattle	6/1 – 10/1	128
2205	Hopkins 13	200	Lease – Sec 15	Cattle	6/1 – 9/30	40
				Horse	6/1 – 9/30	
2206	Wickstrom 17	179	Lease – Sec 15	Cattle	6/16 – 7/16	11
2207	Steers 19	2,522	Lease – Sec 15	Cattle	6/15 – 9/30	146
2208	Pine Bar 21	418	Lease – Sec 15	Cattle	6/1 – 8/31	6
2210	Willow Creek 24	1,108	Lease – Sec 15	Cattle	5/15 – 10/15	274
2211	Squaw Creek	1,174	Lease – Sec 15	Cattle	6/1 – 8/31	209
2212	Frank Ranch 28	582	Lease – Sec 15	Cattle	5/1 – 11/1	110
2213	Spriggs 36	2,196	Lease – Sec 15	Cattle	6/15 – 9/29	70
2214	Meyer Basin	1,273	Lease – Sec 15	Cattle	6/1 – 9/30	233
2215	Wunder 38	1,284	Lease – Sec 15	Cattle	7/1 – 9/15	63
2216	Day 39	106	Lease – Sec 15	Horse	6/1 – 7/13	4
2217	Nicholas 40	428	Lease – Sec 15	Cattle	6/1 – 9/29	48
2218	Double A 41	280	Lease – Sec 15	Cattle	6/1 – 6/30	38
2219	Orchard Draw	964	Lease – Sec 15	Cattle	5/10 – 10/1	124
2220	Red Butte	40	Lease – Sec 15	Cattle	6/1 – 10/31	5
2221	Juniper Hill	200	Lease – Sec 15	Cattle	10/1 – 11/15	15
2222	School Allotment	160	Lease – Sec 15	Cattle	5/1 – 7/2	25
2223	Baldwin Creek 51	200	Lease – Sec 15	Cattle	6/1 – 8/31	18
2224	Natural Lake	235	Lease – Sec 15	Cattle	6/1 – 7/27	22
2225	Crump 53	163	Lease – Sec 15	Horse	6/1 – 11/14	27
2226	Hunter	79	Lease – Sec 15	Cattle	6/1 – 8/31	6
2227	Smith Creek	78	Lease – Sec 15	Cattle	10/1 – 10/7	6
2228	Spriggs 57	120	Lease – Sec 15	Horse	8/1 – 9/30	6
2229	Kaper 59	277	Lease – Sec 15	Cattle	6/1 – 9/30	56
2230	Table Mountain 61	40	Lease – Sec 15	Cattle	6/1 – 9/22	7
2231	Booth 62	121	Lease – Sec 15	Cattle	6/1 – 6/21	8
2232	Beason Creek 63	476	Lease – Sec 15	Cattle	6/1 – 9/30	20
2233	Batrum Gap	474	Lease – Sec 15	Cattle	6/1 – 10/30	96
				Horse	12/1 – 12/15	
2234	Sjostrom 66	168	Lease – Sec 15	Horse	6/1 – 8/31	18
2235	Horny Toad Associate	522	Lease – Sec 15	Cattle	6/1 – 10/30	35
2236	Freeman 70	121	Lease – Sec 15	Horse	5/1 – 9/25	24
2237	North Fork	473	Lease – Sec 15	Cattle	5/10 – 10/31	38
2238	Hilltop	40	Lease – Sec 15	Cattle	3/1 – 6/1	7
				Cattle	11/15 – 2/28	
2239	Cyclone Pass		Not Licensed			
2240	Harvey Basin	1,475	Lease – Sec 15	Cattle	5/15 – 10/30	183
2520	Woods Basin	173	Lease – Sec 15	Cattle	6/20 – 9/30	25
10160	Cedar Ridge LRA	520	Permit – Sec 3	Cattle	3/1 – 2/28	67
10203	Cherry Creek	28,793	Permit – Sec 3	Cattle/Horse	3/1 – 2/28	4,841
10205	Bar Eleven	51,065	Permit – Sec 3	Cattle	3/1 – 2/28	11,419
				Horse		

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
				Sheep		
10224	Stewart Creek <sub>1</sub>	61,284	Permit – Sec 3	Cattle	5/28 – 8/30	149
10533	Steamboat Lake	1,633	Permit – Sec 3	Cattle	3/1 – 2/28	261
				Horse		
11501	Muskrat-Linn	54,118	Permit – Sec 3	Cattle	1/1 – 12/31	6,799
11502	Fraser Draw <sub>1</sub>	73,110	Permit – Sec 3	Cattle	5/16 – 12/16	5,941
11504	Canyon Creek	11,109	Permit – Sec 3	Cattle	5/20 – 10/31	1,400
11505	South Deer Creek	11,319	Permit – Sec 3	Cattle	5/10 – 10/31	1,292
11506	Deer Creek Amp	7,052	Permit – Sec 3	Cattle	5/15 – 11/15	1,297
11507	South Cross L	2,360	Permit – Sec 3	Cattle	3/1 – 5/21	386
				Horse	6/1 – 10/12	
11508	Gas Hills	48,496	Permit – Sec 3	Cattle	5/16 – 12/10	3,547
				Sheep	5/16 – 12/10	
11509	Diamond Springs	40,573	Permit – Sec 3	Cattle	6/10 – 11/20	4,956
				Horse	10/23 – 11/20	
11510	North Willow Creek	3,475	Permit – Sec 3	Cattle	4/20 – 6/10	616
11511	North Dobie Flat	11,469	Permit – Sec 3	Cattle	5/5 – 6/5	1,516
				Cattle	10/15 – 11/30	
11513	Blackjack Ranch	31,197	Permit – Sec 3	Cattle	6/6 – 9/6	1,721
11514	Gap Pasture	3,433	Permit – Sec 3	Cattle	5/1 – 6/2	581
11515	Cross L Pastures	1,327	Permit – Sec 3	Cattle	12/16 – 4/30	316
				Horse	5/26 – 6/24	
11516	Basin Pasture	18,286	Permit – Sec 3	Cattle	7/1 – 11/30	2,471
11517	Bug Meadows Pastures	568	Permit – Sec 3	Cattle	3/1 – 5/31	91
12002	Harris Slough Past	110	Permit – Sec 3	Cattle	4/20 – 5/19	5
12003	Whiskey Peak Incomm <sub>1</sub>	63,446	Permit – Sec 3	Cattle	6/1 – 12/30	5,254
				Sheep		
12004	Green Mountain Fenced	4,310	Permit – Sec 3	Cattle	4/10 – 5/10	652
				Cattle	10/1 – 11/1	
				Horse	8/1 – 9/30	
12005	Home, South of Highway	2,715	Permit – Sec 3	Cattle	12/16 – 3/5	383
12006	46 Pasture <sub>1</sub>	2,683	Permit – Sec 3	Cattle	3/1 – 6/15	488
				Cattle	10/1 – 2/28	
12007	Rigby Pasture	1,091	Permit – Sec 3	Cattle	6/1 – 10/31	176
12012	East Allotment	2,002	Permit – Sec 3	Cattle	10/16 – 11/7	377
				Cattle	4/16 – 5/15	
12013	Fenced Allotment	10,329	Permit – Sec 3	Cattle	5/16 – 10/31	1,703

Allotment Number	Allotment Name	Public Acres	Permit/Lease	Livestock Kind	Season of Use	Public AUMs
12014	South Hat Pasture	1,789	Permit – Sec 3	Cattle	4/15 – 6/13	287
12015	Hadsell Pasture	3,806	Permit – Sec 3	Cattle	5/10 – 10/16	547
12016	State-71 Meadows	274	Permit – Sec 3	Cattle	5/1 – 5/31	51
12018	Alma Grieve Pasture	3,271	Permit – Sec 3	Cattle	10/1 – 2/28	453
12019	Cooper Creek	1,247	Permit – Sec 3	Cattle	6/1 – 7/15	200
				Cattle	10/1 – 12/30	
12020	Cottonwood Pasture	2,019	Permit – Sec 3	Cattle	11/1 – 2/28	265
12242	Squaw Creek	80	Lease – Sec 15	Cattle	10/1 – 11/14	13
14289	Upper Poison Spider Creek	9,065	Permit – Sec 3	Cattle		1,693
				Sheep		
14808	Three Crossings Allotment	1,514	Permit – Sec 3	Cattle	5/1 – 10/11	602
				Cattle	11/10 – 11/30	
20213	Elkhorn LRA (including Oil City Allotment 1602)	305	Permit – Sec 3	Cattle	5/20 – 6/8	791
				Horse	5/15 – 6/14	
				Cattle	7/15 – 10/15	
21519	Miller Springs Pasture	1,884	Permit – Sec 3	Cattle	6/1 – 9/30	313
21520	School Pasture	874	Permit – Sec 3	Cattle	9/1 – 11/30	251
21521	Riddle Pasture	1,350	Permit – Sec 3	Cattle	4/1 – 5/31	306
				Cattle	11/1 – 12/31	
21522	Decker Pasture	331	Permit – Sec 3	Cattle	4/1 – 5/31	49
				Cattle	11/1 – 12/31	
21523	Hay Meadow Pastures	69	Permit – Sec 3	Cattle	12/1 – 4/30	168
31519	Beef Gap Pasture	352	Permit – Sec 3	Cattle	5/1 – 6/2	72
32001	Green Mountain CMN <sub>1</sub>	466,474	Permit – Sec 3	Sheep	3/1 – 2/28	47,361
				Cattle	5/1 – 12/31	
Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.						
<sub>1</sub> Indicates a common allotment.						
AUM Animal Unit Month						

**Table K.2. Allotment Categorization – Current and Proposed**

Allotment	Allotment Name	Existing RMP	Proposed New Category
01323	Fuller Allotment	I	I
180	Lost Creek	M	M
00655	Copper Mountain	I	I
01301	Cantril Jack Allotment	M	M
01302	North of CB&Q Railroad	C	I

Allotment	Allotment Name	Existing RMP	Proposed New Category
01303	South of CB&Q Railroad	M	I
01304	Crawford Creek	I	I
01305	Lybyer North	I	I
01306	Canning Allotment	M	M
01307	Mallet-Smith Pasture	C	C
01308	167A Scott Robson	M	M
01309	Logan Pasture	M	M
01310	Cottonwood Pass	C	I
01311	Keenan	C	C
01312	North of Tracks	M	I
01313	South of Tracks	I	I
01314	Moneta Hills Pasture	M	M
01315	Ditch Pasture	C	C
01316	Madden Ranch Pasture	C	C
01317	Brandau Ranch Allotment	C	I
01318	Below the Hill Pasture	M	M
01319	Twidale	C	C
01320	St. Clair West	C	I
01321	St. Clair Ranch	C	C
01322	St. Clair South Past.	I	I
01324	Hoodoo Creek Allotment	I	I
01325	East of Ranch	I	I
01326	Lichtenstein	I	I
01327	Myrtle Reed Allotment	I	I
01328	Battle Axe South	M	M
01329	Lysite Mountain	I	I
01330	Battle Axe Lysite	M	M
01331	Battle Axe Berger	M	I
01332	Bow & Arrow	M	M
01333	Gates Draw Allotment	I	I
01334	Cottonwood Pass	I	I
01335	OCLA South of Railroad	I	I
01336	OCLA North of Railroad	I	I
01337	De Pass Ranch	C	C
01338	Fuller Ranch Pasture	I	I
01339	Picard Private Allotment	I	I
01340	168A North of Seeps	C	I
01341	168A Stock Driveway	M	M
01342	Knapp Individual	C	C
01343	Tuff Creek Pasture	C	I
01344	Westfall	I	I
01345	Mountain Pasture	C	I
01346	Bonneville Reservoir	I	I
01347	Jones Creek Basin	I	M
01348	J. Herbst Summer	M	I
01349	J. Herbst Tuff Creek	C	I
01350	Wm. Herbst Summer	C	C
01351	Scott Draw	I	M
01352	Joe Johns Pasture	C	C
01353	Campbell	M	M
01354	Stinking Well	I	I
01355	Lookout Hill	M	M
01356	Howard Pasture	I	I



Allotment	Allotment Name	Existing RMP	Proposed New Category
01357	Summer Allotment	M	M
01358	Top of Mountain Pasture	C	C
01359	Ramage Ranch	I	I
01360	Ruth Fuller Private	C	C
01361	Copper Mountain (Lander)	C	C
01362	Lybyer South	I	M
01363	Hoodoo HQ Pastures	C	C
01364	Red Ranch Pasture	C	C
01365	Quien Sabe Ranch Pasture	I	M
01366	Cabin Pasture	C	C
01367	Henrich Pasture	I	I
01368	Bridger Creek	C	C
01369	Picard Ranch HQ	C	C
01373	Copper Mountain	C	C
01401	Rim Pasture	I	I
01402	Delfelder Allotment	I	I
01403	Conant Creek Common	I	I
01404	Wm. Herbst Winter	I	I
01405	Posey North Allotment	I	I
01406	Poison Creek	M	M
01407	Muskrat Amp	I	I
01408	Township Pasture	I	I
01409	Muskrat Open	I	I
01410	Posey Pasture	I	I
01411	Shoshoni Road	I	I
01412	Poston Winter	I	M
01413	Pipeline Pasture	I	M
01414	Anderson Winter	M	M
01415	Myers Pasture	I	M
01416	Lame Jack Draw	I	I
01417	Haybarn Hill	C	I
01512	South Dobie Flat	M	I
01518	Little Bug Pasture	M	M
01519	Miller Springs Pasture	M	I
01520	School Pasture	M	M
01521	Riddle Pasture	M	M
01523	Bug Lake	M	M
01601	Dodds Allotment	M	M
01604	#17 Horse Heaven Pasture	M	I
01605	#18 Horse Creek Pasture	M	M
01606	#19 Vinegar Hill Pasture	M	M
01607	#16 Phillips Pasture	M	M
01608	#20 Calf Pasture	M	M
01609	#21 Horse Pasture	M	M
01610	#22 Bull Pasture	C	C
01612	Hamilton Rock Pasture	M	M
01614	Circle Bar Allotment	M	I
01615	North of Drift Fence	M	I
01616	Keester	M	M
01619	Winter Pastures	M	M
01620	Cabin Creek Pasture	C	C
01622	Hat Ranch	I	M
01623	Murphree Pastures	I	I

Allotment	Allotment Name	Existing RMP	Proposed New Category
01625	Jamerman Pastures	M	M
01626	Mud Lake	C	C
01628	Sage Hen	M	M
01629	JJ Winter Pastures	C	C
01630	Tram Road Pasture	M	I
01631	Claytor Homestead	C	C
01632	North Hat Pasture	M	M
01633	Stamped Bog	C	M
01635	Big Rock Pasture	I	I
01636	Granite Mountain Open	I	I
01638	Winter Allotment	M	M
01640	Garson Ranch	C	C
01642	Devils Gate	M	M
01644	Turkey Track	I	I
01660	Home, North of Highway	M	M
01701	Flagg Amp	I	I
01702	Flagg Individual	C	C
01703	Big Pasture	I	I
01704	Breeding Pasture	M	M
01705	Myers Fenced Pasture	I	I
01706	Trent & Home Place	M	M
01707	Ice Slough	I	I
01709	Long Creek Pasture	I	M
01710	Graham Ranch Pasture	M	M
01711	Hay Meadow Pasture	C	C
01712	Long Creek Sweetwater	C	C
01713	Whitlock Fenced	I	I
01714	Scarlett Pasture	C	C
01715	Horse Pasture	M	M
01716	Dishpan Butte	I	I
01717	Fenced Individual	I	M
01801	East Beaver Common	I	I
01802	Sand Draw Amp	I	I
01803	Government Draw	I	I
01804	Government Draw – Lower Beaver	I	I
01805	Kirby-Reservation Boundary	I	I
01806	Griffin Beaver Creek	M	M
01807	Baldwin Pasture	I	I
01808	Hudson Draw Private Allotment	M	M
01809	Bringolf Ranch	C	C
01810	Yellowstone Ranch	C	C
01813	Blue Ridge	C	C
01814	Highway Pasture	C	C
01901	Atlantic City Common	I	I
01902	Cottonwood Basin	I	I
01903	Silver Creek Common	I	I
01904	Devils Canyon Amp	I	I
01905	Ellis Upper Beaver	I	I
01906	Twin Creek Individual	I	I
01907	Commissary Hill	I	M

Allotment	Allotment Name	Existing RMP	Proposed New Category
01908	Little Popo Agie Amp	I	M
01909	Onion Flat	I	I
01910	Sawmill Basin	I	I
01911	Red Canyon Amp	I	I
01912	Twin Creek Private	C	C
01913	McGraw Flat Individual	I	I
01914	McGraw Flat Common	I	I
01915	Beaver Amp	I	I
01916	Hall Creek Individual	I	I
01917	Cottonwood Divide	I	I
01918	McGraw Flat-U. Beaver	I	I
01919	Gravel Springs Allotment	I	I
01920	Salisbury Amp	I	I
01921	Level Meadows	I	I
01922	P. Heart Individual	I	I
01923	Atlantic City Upper Fenced	C	C
01924	Atlantic City Lower Fenced	C	C
01925	Hall Creek Winter Past	M	M
01926	McKinney Individual	I	I
01927	Upper Ellis Ranch	C	C
01928	Lower Ellis Ranch	C	C
01929	Barras Spring	C	C
01930	Long Willow	C	C
1931	Woolery Individual	M	M
01932	Sheep Mountain	M	M
01933	Lazy Y	C	C
01934	Red Canyon Rim	I	M
01935	Bowman Ranch	C	C
01936	Derby Allotment	M	M
01937	Little Knoll	C	C
01938	Bergstedt Ranch	C	C
01939	Auer Ranch	C	C
01940	Henton Ranch	C	C
01941	Flat Onion	I	I
01943	Red Bluff Creek	M	M
02009	Alkali Pasture	M	M
02011	Highway Allotment	I	I
02019	Cooper Creek	M	M
02021	Willow Creek Allotment	C	C
02023	Crooks Gap	M	M
02025	Leckinby Pasture	M	M
02026	Little Camp Creek	I	I
02028	Mitchell Pasture	C	C
02029	Diamond Hook	C	C
02103	Lime Kiln Gulch	C	C
02104	Little Warm Spring Canyon	M	M
02106	Fire Ridge	M	M
02107	Wells 11	M	M
02108	Geyser Creek	M	M
02109	Cross 14	C	C
02110	Little Horse Creek	I	I
02111	E A Mountain 16	M	M
02112	Bear Creek No. 2112	C	C

Allotment	Allotment Name	Existing RMP	Proposed New Category
02113	Crooked Creek	C	C
02114	Spence 23	C	C
02115	Hat Butte Ranch	C	C
02116	Elk Ridge Southeast	C	C
02117	Blue Holes	C	C
02119	White Pass 31	C	C
02120	Windy Ridge	C	C
02121	Mason Draw	I	I
02122	Tappan Creek 34	I	I
02123	Battrum Mountain	C	I
02125	Albright 47	C	C
02126	CM 49	M	M
02127	Wagon Gulch	C	C
02128	Bitterroot 60	C	C
02130	Cross 67	C	C
02132	Stoney Point 73	C	C
02201	North Fork Rim	M	M
02202	Baldwin Creek School	C	C
02203	Madison Creek	C	C
02204	Table Mountain 9	C	C
02205	Hopkins 13	I	I
02206	Wickstrom 17	I	C
02207	Steers 19	I	I
02208	Pine Bar 21	M	M
02210	Willow Creek 24	I	I
02211	Squaw Creek	I	I
02212	Frank Ranch 28	C	C
02213	Spriggs 36	I	C
02214	Meyer Basin	I	I
02215	Wunder 38	I	C
02216	Day 39	C	C
02217	Nicholas 40	I	I
02218	Double A 41	I	I
02219	Orchard Draw	I	I
02220	Red Butte	I	I
02221	Juniper Hill	C	C
02222	School Allotment	I	I
02223	Baldwin Creek 51	I	I
02224	Natural Lake	C	C
02225	Crump 53	I	I
02226	Hunter	C	C
02227	Smith Creek	C	C
02228	Spriggs 57	I	I
02229	Kaper 59	C	C
02230	Table Mountain 61	C	C
02231	Booth 62	C	C
02232	Beason Creek 63	I	I
02233	Batrum Gap	C	C
02234	Sjostrom 66	C	C
02235	Horny Toad Associate	I	I
02236	Freeman 70	I	I
02237	North Fork	C	C
02238	Hilltop	C	C

Allotment	Allotment Name	Existing RMP	Proposed New Category
02239	Cyclone Pass	I	I
02240	Harvey Basin	I	I
02520	Woods Basin	C	C
10160	Cedar Ridge LRA	C	C
10203	Cherry Creek	I	I
10205	Bar Eleven	I	I
10224	Stewart Creek	I	I
10533	Steamboat Lake	C	C
11501	Muskat-Linn	I	I
11502	Fraser Draw	M	M
11504	Canyon Creek	I	M
11505	South Deer Creek	I	M
11506	Deer Creek Amp	I	I
11507	South Cross L	M	M
11508	Gas Hills	M	I
11509	Diamond Springs	I	I
11510	North Willow Creek	M	M
11511	North Dobie Flat	M	I
11513	Blackjack Ranch	I	I
11514	Gap Pasture	M	M
11515	Cross L Pastures	M	M
11516	Basin Pasture	M	I
11517	Bug Meadows Pastures	M	M
12002	Harris Slough Past	C	C
12003	Whiskey Peak Incomm.	I	I
12004	Green Mountain Fenced	I	I
12005	Home, South of Highway	I	I
12006	46 Pasture	I	I
12007	Rigby Pasture	I	I
12012	East Allotment	M	M
12013	Fenced Allotment	I	I
12014	South Hat Pasture	M	M
12015	Hadsell Pasture	I	I
12016	State-71 Meadows	C	C
12018	Alma Grieve Pasture	M	M
12020	Cottonwood Pasture	M	M
12242	Squaw Creek	C	C
14289	Upper Poison Spider Creek	I	I
14808	Three Crossings Allotment	M	M
20213	Elkhorn – LRA	I	I
21522	Decker Pasture	M	C
31519	Beef Gap Pasture	M	I
32001	Green Mountain CMN	I	I

Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.

RMP Resource Management Plan

**Table K.3. Lander Field Office Grazing Allotments Assessed for Meeting Standards**

Allotment Number	Allotment Name	Year Assessed	Acres Assessed	Meeting Standards	Not Meeting Standards – Management Implemented	Not Meeting Standards – Causal Factors Not Determined	Not Meeting Standards – Other Than Livestock Grazing
1307	Mallet-Smith Pasture	2003	181	X			
1324	Hoodoo Creek	2001	23,209		X		
1327	Myrtle Reed	2003	1,209	X			
1329	Lysite Mountain	1998	8,192	X			
1330	Battle Axe Lysite	2000	4,298	X			
1334	Cottonwood Pass	1998	3,900	X			
1335	OCLA South of Railroad	2000	6,413	X			
1336	OCLA North of Railroad	2000	4,861		X		
1337	De Pass Ranch	2000	472	X			
1338	Fuller Ranch Pasture	2000	1,477		X		
1341	Stock Driveway	2000	2,185		X		
1358	Top Of Mountain Pasture	2001	1,449	X			
1359	Ramage Ranch	1998	12,060				X
1363	Hoodoo HQ Pasture	2001	149			X	
1369	Picard Ranch HQ	2000	169		X		
1373	Copper Mountain	2001	128	X			
1401	Rim Pasture	2000	19,095	X			
1403	Conant Creek	2000	50,376	X			
1404	Wm. Herbst Winter	2000	2,989		X		
1405	Posey North	2000	4,431		X		
1412	Poston Winter	2000	3,239	X			
1414	Anderson Winter	2000	5,924	X			
1416	Lame Jack Draw	2000	6,060	X			
1417	Haybarn Hill	2000	10,288	X			
1506	Deer Creek AMP	1998	7,000				X
1508	Gas Hills	1998	42,201	X			
1509	Diamond Springs	2008	40,890			X	

<b>Allotment Number</b>	<b>Allotment Name</b>	<b>Year Assessed</b>	<b>Acres Assessed</b>	<b>Meeting Standards</b>	<b>Not Meeting Standards – Management Implemented</b>	<b>Not Meeting Standards – Causal Factors Not Determined</b>	<b>Not Meeting Standards – Other Than Livestock Grazing</b>
1511	North Dobie Flat	2008	11,435			X	
1512	South Dobie Flat	2008	6,752			X	
1513	Black Jack Ranch	2008	31,708			X	
1633	Stampede Bog	2000	301	X			
1704	Breeding Pasture	2001	17,107	X			
1705	Myers Fenced Pasture	2001	1,288	X			
1706	Trent & Home Place	2001	500	X			
1707	Ice Slough	2002	947	X			
1709	Long Creek Pasture	2001	2,406	X			
1710	Graham Ranch Pasture	2001	1,118	X			
1712	Long Creek Sweetwater	2001	388	X			
1713	Whitlock Fenced	2001	1,086	X			
1714	Scarlett Pasture	2001	173	X			
1715	Horse Pasture	2004	133	X			
1802	Sand Draw AMP	1999	11,092	X			
1805	Kirby Reservation Boundary	2000	5,333	X			
1806	Griffin Beaver Creek	2000	6,068	X			
1901	Atlantic City Common	2001	39,094		X		
1903	Silver Creek Common	2000	33,702		X		
1904	Devils Canyon AMP	2004	3,717			X	
1905	Ellis Upper Beaver	2000	3,326	X			
1906	Twin Creek Individual	1998	7,602	X			
1908	Little Popo Agie AMP	1998	8,651	X			
1911	Red Canyon AMP	1999	3,699		X		

Allotment Number	Allotment Name	Year Assessed	Acres Assessed	Meeting Standards	Not Meeting Standards – Management Implemented	Not Meeting Standards – Causal Factors Not Determined	Not Meeting Standards – Other Than Livestock Grazing
1914	McGraw Flat Common	2000	10,149	X			
1915	Beaver AMP	2004	10,640			X	
1916	Hall Creek Individual	1998	12,711				X
1921	Level Meadows	2000	3,271	X			
1923	Atlantic City Upper Fenced	2000	60	X			
1924	Atlantic City Lower Fenced	2000	78	X			
1925	Hall Creek Winter Pasture	1998	1,305	X			
1927	Upper Ellis Ranch	2002	598	X			
1928	Lower Ellis Ranch	2002	339	X			
1934	Red Canyon Rim	1998	853	X			
1939	Auer Ranch	2004	427	X			
2001	Green Mountain Common	1999	468,379		X		
2002	Harris Slough Pasture	2001	94	X			
2210	Willow Creek	2009	982				
2219	Orchard Draw	1998	1361	X			
			971,718				

Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.

Recent reporting of allotment assessments by the Bureau of Land Management presents somewhat different data than what is represented in this table. The Lander Field Office is in the process of reviewing allotment assessment data and will update this table and other allotment assessment data presented in Chapter 3, as appropriate, subsequent to the release of the Draft Resource Management Plan.

**Table K.4. Allotment Management Plans and Rangeland Management Agreements Developed**

Allotment Number	Allotment Name	AMP Implement Date	Public Acres
01330	Battle Axe Lysite	08/23/89	4,298
01361	Copper Mountain (Lander)	03/29/96	270
01401	Rim Pasture	05/01/92	19,037
01403	Conant Creek Common	07/15/92	47,078
01406	Poison Creek*	08/06/97	16,815
01407	Muskrat Amp	11/01/68	39,876
01408	Township Pasture*	05/16/94	19,162



Allotment Number	Allotment Name	AMP Implement Date	Public Acres
01414	Anderson Winter	05/01/92	5,914
01415	Myers Pasture*	06/10/95	923
01512	South Dobie Flat	06/11/92	6752
01636	Granite Mountain Open*	03/24/93	77,896
01643	Rawlins Draw	05/21/08	6,367
01660	Home, North of Highway	06/11/92	1,353
01701	Flagg Amp	06/01/69	11,361
01703	Big Pasture	07/05/91	74,351
01802	Sand Draw Amp	05/01/66	11,905
01803	Government Draw	11/26/90	77,299
01901	Atlantic City Common	07/31/97	38,765
01903	Silver Creek Common	05/08/97	31,953
01904	Devils Canyon Amp	05/01/69	3,717
01905	Ellis Upper Beaver	05/01/70	2,370
01906	Twin Creek Individual	03/28/93	7,532
01907	Commissary Hill	06/14/94	994
01908	Little Popo Agie Amp	06/01/70	10,760
01911	Red Canyon Amp	06/01/69	4009
01914	Mcgraw Flat Common	05/08/97	11,295
01915	Beaver Amp	06/01/69	10,640
01916	Hall Creek Individual	12/20/89	14,386
01920	Salisbury Amp	11/01/69	5,384
01925	Hall Creek Winter Past	12/20/89	492
01926	McKinney Individual*	04/03/97	800
01934	Red Canyon Rim	06/14/94	853
01939	Auer Ranch	06/01/69	427
102019	Cooper Creek	10/01/87	1,402
02021	Willow Creek Allotment	10/01/87	71
02029	Diamond Hook	10/01/87	207
02219	Orchard Draw	06/09/69	804
11504	Canyon Creek	02/25/99	11,065
11505	South Deer Creek	09/23/88	11,225
11506	Deer Creek Amp	05/01/69	6,447
11507	South Cross L	06/11/92	2,347
11509	Diamond Springs	06/11/92	40,890
11510	North Willow Creek*	05/21/08	3469
11511	North Dobie Flat	06/11/92	11,435
11513	Blackjack Ranch	06/11/92	31,708
11514	Gap Pasture	06/11/92	3,604
11515	Cross L Pastures	06/11/92	1,535
11516	Basin Pasture	02/16/01	16,830
12003	Whiskey Peak	10/01/87	76,083
12005	Home, South Of Highway	06/11/92	2,560
12018	Alma Grieve Pasture	10/01/87	3,249
31519	Beef Gap Pasture	06/11/92	381
<b>Total Allotments:</b>	<b>52</b>	<b>Total Acres:</b>	<b>790,346</b>
Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.			
*Denotes Rangeland Management Agreement.			
AMP Allotment Management Plan			

Table K.5. Summary of Range Improvements Lander Field Office, 1986-2009

Fiscal Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Grand Total
Im-prove-ment Fences																									
Antelope drop panels								18.5												0.1					18.6
Electric								5	3		3	9		5	9	34	10	4.75		20.9	9.7				113.38
Exclosures, enclosures			1	2	1	5.5	3.3		1.4	1.4	1	0.5					5.7	2.7	1	1					27.5
Four strand plus	23.1	9.7	2.7		1			1	1	1	0.52	3.13		0.35	2.7	6.8	6.2	2.05		1.4	1	1.25			64.9
Three strand		4	1		17	4.2	9.05	11.2	5.84	6.3		29.2	11.2		4.8	3	5	2.6		9.4	2.5				126.19
Wood Rail													0.1	0.25					0.25	0.1		0.5			1.2
Other			0.1			1.3	0.2	1							1										3.6
Fence Total (Miles)	23.1	13.7	4.8	2	19	11	12.6	36.7	11.2	8.7	4.52	41.8	11.3	5.6	17.5	43.8	26.9	12.1	1.25	32.9	13.2	1.75	0	0	355.4
Land Treatments																									
Lake and Wetland Improvement					1															3			1		5

<b>Fiscal Year</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>Grand Total</b>
Lake and Wet-land Improvement Total																				3			1		4
Land Treatment						5		6.5	50	9	35						100		100						305.5
<b>Land Treatment Total</b>					<b>1</b>	<b>5</b>		<b>6.5</b>	<b>50</b>	<b>9</b>	<b>35</b>						<b>100</b>		<b>100</b>	<b>6</b>			<b>2</b>		<b>314.5</b>
Management Facility																									
Cattle-guard for vehicle use	2	2	1			1	2		1	7			1		11				1						29
Corrals and loading chutes						1																			1
Line Cabins																	1								1
Other																				1					1

<b>Fiscal Year</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>Grand Total</b>
<b>Management Facility Total (Each)</b>	2	2	1			2	2		1	7			1		11		1		1	1					32
<b>Vegetation Manipulation</b>																									
Stream Improvement											1														1
Chemical																				313			2,300		2,613
Cutting or Beating																					4,000	1,220			5,220
Prescribed Fire	910	160	250	100			1,228		12			56													2,716
<b>Vegetation Manipulation Total (Acres)</b>	<b>910</b>	<b>160</b>	<b>250</b>	<b>100</b>			<b>1,228</b>		<b>12</b>		<b>1</b>	<b>56</b>								<b>313</b>	<b>4,000</b>	<b>1,220</b>	<b>2,300</b>		<b>10,550</b>
<b>Water Control/Development</b>																									

<b>Fiscal Year</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>Grand Total</b>
Pipe-lines (miles)	1	5		4	9		9.2	3	5		1	7.26	10	5	38	1		2		7.5		0	1	1	109.96
Check Dams, earthen (each)				2																					2
Reservoirs (each)	6	5	2	2	6	1	4	2	6	5	3		3	1		2	5								53
Retention Dams: retains water/silt; primary object (each)							1		1		1														3
Sheet piling drop structure (each)													1				1								2
Springs (each)		2	3		1		1	1	4	7	5	2	1	1	3	2	2	2					1		38
Supplemental Water Storage (each)												1	1												2
Wells (each)	6		4	4	8	3	3		1	3	2	7	2	5	12	2	5	3	3	1	1		1		76

<b>Fiscal Year</b>	<b>1986</b>	<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>Grand Total</b>
<b>Water Control/ Development Total</b>	<b>12</b>	<b>7</b>	<b>9</b>	<b>8</b>	<b>15</b>	<b>4</b>	<b>9</b>	<b>3</b>	<b>12</b>	<b>15</b>	<b>11</b>	<b>10</b>	<b>8</b>	<b>7</b>	<b>15</b>	<b>6</b>	<b>13</b>	<b>5</b>	<b>3</b>	<b>1</b>	<b>1</b>		<b>2</b>	<b>0</b>	<b>176</b>
Weed Control (acres)	0	246	240	297	60	207	183	156	69	18	56	216	408	561	882	735	620	800	770	948	700	996	0	1,650	10,818

Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.

**Table K.6. Animal Unit Months Authorized, 1989-2008**

<b>Year</b>	<b>AUMs Billed</b>	<b>Percent Actual Use</b>
1989	230,351	82
1990	217,122	78
1991	211,366	76
1992	217,322	78
1993	227,202	81
1994	218,276	78
1995	223,874	80
1996	247,568	89
1997	221,688	79
1998	228,616	82
1999	245,140	88
2000	246,760	88
2001	220,107	77
2002	152,198	54
2003	143,590	51
2004	177,260	63
2005	191,272	68
2006	160,237	57
2007	143,026	51
2008	167,170	60
<b>Average Total:</b>	<b>204,507</b>	<b>73</b>
Note: Data in table derived from Bureau of Land Management Lander Field Office internal databases accessed in 2010.		
AUM Animal Unit Month		

# Appendix L. Economic Impact Analysis Methodology

## L.1. Introduction

This appendix describes the methods and data that underlie the economic impact modeling analysis. Input-output models such as the Impact Analysis for Planning (IMPLAN) model, an economic impact analysis model, provide a quantitative representation of the production relationships between individual economic sectors. Thus, the economic modeling analysis uses information about physical production quantities and the prices and costs for goods and services. The inputs required to run the IMPLAN model are described in the following narrative and tables. The resulting estimates from the IMPLAN model, by alternative, can be found in the Economic Conditions section in Chapter 4. The first section of this appendix describes general aspects of the IMPLAN model and how it was used to estimate economic impacts. The remaining sections provide additional detailed data used in the analysis for oil and gas, livestock grazing, and recreation.

## L.2. The IMPLAN Model

IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the ripple effect (also called the "multiplier effect") of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly impacted) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

This analysis used IMPLAN 2007; prior to running the model, cost and price data were converted to a consistent dollar year (2007) using regional and sector-specific adjustment factors from the IMPLAN model. The values in this appendix are expressed in year 2007 dollars so that the earnings and employment estimates can be easily compared to the latest (i.e., 2007) earnings and employment data available from the Bureau of Economic Analysis.

The current IMPLAN model has 440 economic sectors, of which 221 are represented in the five planning area counties. This analysis involved direct changes in economic activity for 33 IMPLAN economic sectors, as well as changes in all other related sectors due to the ripple effect. The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the study area. As a result, the calibrated model does a better job of generating multipliers and the subsequent impacts that reflect the interaction between and among the sectors in the study area compared to a model using unadjusted national coefficients. For instance, worker productivity in oil and gas production is higher in Wyoming than the national average. Key variables used in the IMPLAN model were filled in using data specific to Wyoming, including employment estimates, labor earnings, and total industry output. The IMPLAN model is run at a regional (multi-county) scale, with the coefficients that describe linkages between sectors aggregated to the five-county level. Because of this mathematical aggregation, it is not possible to identify total economic impacts for an individual community.



### L.3. Oil and Gas

The economic impacts analysis for oil and gas reflects drilling, completion, and production activities. The number of wells drilled and completed is based on the Reasonable Foreseeable Development scenario (BLM 2009d) and the constraints applied under each alternative. Total well numbers for each alternative are presented in Table L.1, “Oil and Gas Well Numbers” (p. 1478). Table L.2, “Projected Oil and Gas Production (Federal Surface)” (p. 1479) presents the quantity of oil and gas produced on federal surface, and Table L.3, “Projected Oil and Gas Production (Federal State, and Fee Surface)” (p. 1480) presents the projected quantity of oil and gas produced from federal, state, and private (fee) surface.

**Table L.1. Oil and Gas Well Numbers**

Item	Non-Coalbed Exploratory	Non-Coalbed Development	Coalbed Natural Gas	Deep	Total
<b>Federal Surface</b>					
Alternative A – Wells Drilled	237	1,511	480	46	2,274
Alternative A – Wells Completed	142	1,209	432	37	1,820
Alternative B – Wells Drilled	189	1,209	93	37	1,528
Alternative B – Wells Completed	113	967	84	30	1,194
Alternative C – Wells Drilled	237	1,516	484	47	2,284
Alternative C – Wells Completed	142	1,213	436	38	1,828
Alternative D – Wells Drilled	227	1,447	406	45	2,125
Alternative D – Wells Completed	136	1,158	365	36	1,695
<b>Federal, State, and Fee Surface</b>					
Alternative A – Wells Drilled	331	2,107	823	73	3,334
Alternative A – Wells Completed	199	1,686	741	58	2,683
Alternative B – Wells Drilled	283	1,806	436	63	2,588
Alternative B – Wells Completed	170	1,445	392	50	2,057
Alternative C – Wells Drilled	331	2,112	827	74	3,344
Alternative C – Wells Completed	199	1,690	744	59	2,692
Alternative D – Wells Drilled	321	2,044	749	71	3,185
Alternative D – Wells Completed	193	1,635	674	57	2,559
Source: BLM 2009d					

**Table L.2. Projected Oil and Gas Production (Federal Surface)**

Year	Alternative A		Alternative B		Alternative C		Alternative D	
	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)
2008	131.9	2.2	99.4	1.7	132.5	2.2	123.0	2.1
2009	147.7	2.2	111.4	1.7	148.3	2.2	137.8	2.1
2010	153.4	2.3	115.7	1.7	154.1	2.3	143.2	2.1
2011	154.5	2.3	116.5	1.7	155.2	2.3	144.1	2.1
2012	165.2	2.3	124.6	1.7	165.9	2.3	154.1	2.2
2013	180.7	2.3	136.3	1.8	181.5	2.3	168.6	2.2
2014	183.6	2.5	138.4	1.9	184.4	2.5	171.3	2.4
2015	195.9	2.4	147.7	1.8	196.7	2.4	182.8	2.2
2016	218.2	2.5	164.5	1.9	219.1	2.5	203.5	2.3
2017	213.0	2.4	160.6	1.8	214.0	2.4	198.8	2.2
2018	220.7	2.2	166.4	1.6	221.7	2.2	205.9	2.0
2019	244.0	2.4	184.0	1.8	245.1	2.5	227.6	2.3
2020	255.3	2.5	192.5	1.9	256.4	2.6	238.2	2.4
2021	270.5	2.7	204.0	2.0	271.8	2.7	252.4	2.5
2022	274.7	2.6	207.2	1.9	275.9	2.6	256.3	2.4
2023	280.8	2.8	211.8	2.1	282.1	2.8	262.0	2.6
2024	299.7	2.7	226.0	2.0	301.0	2.7	279.6	2.5
2025	305.8	2.7	230.6	2.1	307.2	2.7	285.4	2.5
2026	317.0	2.7	239.1	2.1	318.4	2.8	295.8	2.6
2027	318.4	2.9	240.1	2.2	319.9	2.9	297.1	2.7
Source: BLM 2009d. Estimated from production on federal, state, and fee surface, multiplied by the percentage of federal wells.								
BCF billion cubic feet								
MMBO million barrels								

**Table L.3. Projected Oil and Gas Production (Federal State, and Fee Surface)**

Year	Alternative A		Alternative B		Alternative C		Alternative D	
	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)	Gas (BCF)	Oil (MMBO)
2008	194.4	3.3	162.6	2.7	195.0	3.3	185.7	3.1
2009	217.7	3.3	182.1	2.8	218.4	3.3	208.0	3.1
2010	226.3	3.3	189.2	2.8	226.9	3.4	216.1	3.2
2011	227.8	3.4	190.5	2.8	228.4	3.4	217.6	3.2
2012	243.6	3.4	203.7	2.8	244.3	3.4	232.7	3.2
2013	266.4	3.4	222.8	2.9	267.2	3.4	254.5	3.3
2014	270.7	3.7	226.3	3.1	271.5	3.7	258.6	3.6
2015	288.8	3.5	241.5	2.9	289.7	3.5	275.9	3.4
2016	321.7	3.6	269.0	3.0	322.6	3.7	307.3	3.5
2017	314.1	3.5	262.7	2.9	315.0	3.5	300.1	3.3
2018	325.4	3.2	272.1	2.7	326.4	3.2	310.9	3.1
2019	359.7	3.6	300.8	3.0	360.8	3.6	343.7	3.4
2020	376.4	3.8	314.7	3.1	377.5	3.8	359.6	3.6
2021	398.9	3.9	333.6	3.3	400.1	3.9	381.1	3.7
2022	405.0	3.8	338.7	3.2	406.3	3.8	386.9	3.6
2023	414.0	4.1	346.2	3.4	415.3	4.1	395.5	3.9
2024	441.9	3.9	369.5	3.3	443.2	3.9	422.1	3.8
2025	451.0	4.0	377.1	3.4	452.3	4.0	430.8	3.8
2026	467.4	4.0	390.9	3.4	468.9	4.1	446.6	3.9
2027	469.5	4.3	392.6	3.6	470.9	4.3	448.5	4.1

Source: BLM 2009d

BCF billion cubic feet  
MMBO million barrels

The costs of drilling and completing wells and producing oil and gas are also relevant for the economic impact analysis, because a portion of these costs represents spending on local services and locally produced products. Table L.4, “Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type” (p. 1481) provides a summary of the costs of drilling, completion, and production for each well type (non-coalbed development, non-coalbed exploratory, coalbed natural gas, and deep) used for the economic analysis.

**Table L.4. Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion According to Well Type**

Assumption	Well Type			
	Non-Coalbed Exploratory	Non-Coalbed Development	Coalbed Natural Gas	Deep
<b>Well Drilling Impacts</b>				
Drilling Cost (\$/well)	\$1,292,076	\$1,174,615	\$434,648	\$5,603,020
Local Drilling Costs <sup>1</sup>	75%	75%	75%	75%
Local Direct Impact (\$/well)	\$969,057	\$880,961	\$325,986	\$4,202,265
Local Total Impact (\$/well) <sup>2</sup>	\$1,350,770	\$1,227,973	\$445,006	\$5,825,255
Multiplier (total impact/direct impact)	1.39	1.39	1.37	1.39
<b>Well Completion Impacts</b>				
Completion Cost (\$/well)	\$1,396,749	\$1,269,772	\$892,071	\$2,580,899
Local Completion Costs <sup>1</sup>	75%	75%	75%	75%
Local Direct Impact (\$/well)	\$1,047,562	\$952,329	\$669,053	\$1,935,674
Local Total Impact (\$/well) <sup>2</sup>	\$1,470,533	\$1,336,848	\$836,215	\$2,530,834
Multiplier (total impact/direct impact)	1.40	1.40	1.25	1.31
Source: BLM 2010k. Data are based on Authorizations For Expenditure provided by exploration and development companies, converted from 2009 to 2007 dollars using adjustment factors (that differ by economic sector) from the IMPLAN 2007 model. <sup>1</sup> The local cost shares were based on the percent of total drilling or completion costs that would be spent on goods and services purchased from the local economy. Most services come from Rock Springs, Riverton, Rawlins and Casper. All of these communities are located within the planning area identified counties. However, a portion of the value comes from outside the planning area, even for supplies purchased locally, because the raw material and embedded labor comes from outside the planning area. <sup>2</sup> Total impacts estimated using IMPLAN include direct, indirect, and induced impacts. IMPLAN Impact Analysis for Planning				

Table L.5, “Assumptions for Analysis of Economical Impacts on Output for Oil and Gas Production” (p. 1482) provides the assumptions used to determine the economic impact associated with the production of oil and gas. For the analysis, Bureau of Land Management (BLM) estimated a production cost (for gas) of \$1.43 per thousand cubic feet (mcf), in year 2007 dollars, based on data from the Energy Information Administration (Taylor 2010).

**Table L.5. Assumptions for Analysis of Economical Impacts on Output for Oil and Gas Production**

<b>Economic Impact</b>	<b>Oil Production (per million barrels)</b>	<b>Gas Production (per billion cubic feet)</b>
Direct Economic Impact <sup>1</sup>	\$63,300,000 <sup>2</sup>	\$4,010,000 <sup>3</sup>
Indirect Economic Impact <sup>4</sup>	\$9,942,658	\$629,859
Induced Economic Impact <sup>5</sup>	\$2,678,476	\$169,679
Total Economic Impact	\$75,921,134	\$4,809,538
Multiplier (total impact/direct impact)	1.20	1.20
Note: All dollar values are in 2007 dollars. <sup>1</sup> Direct economic impact is the market value of output. <sup>2</sup> Based on an oil price of \$63.30 per barrel, which is an average of the prices for 2009-2014 projected by the Wyoming Consensus Revenue Estimating Group (CREG 2009b) and adjusted to 2007 dollars. <sup>3</sup> Based on a gas price of \$4.01 per mcf, which is an average of the prices for 2009-2014 projected by the Wyoming Consensus Revenue Estimating Group (CREG 2009b) and adjusted to 2007 dollars. <sup>4</sup> Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide supplies to the oil and gas industry. <sup>5</sup> Induced impacts from IMPLAN reflect increased demand in the consumer and government sectors. IMPLAN Impact Analysis for Planning		

The forecasted number of wells and production used for estimating employment impacts is the same as for estimating impacts on labor earnings and output. Table L.6, “Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type” (p. 1482) shows the direct and total employment impacts attributable to drilling and completion.

**Table L.6. Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion According to Well Type**

<b>Employment Impact</b>	<b>Well Type</b>			
	<b>Non-Coalbed Exploratory</b>	<b>Non-Coalbed Development</b>	<b>Coalbed Natural Gas</b>	<b>Deep</b>
<b>Well Drilling Impacts</b>				
Direct Employment (jobs/well)	4.40	4.00	1.50	19.80
Total Employment Impact (jobs/well)	7.59	6.90	2.50	32.80
Multiplier (Total Impact/Direct Impact)	1.73	1.73	1.67	1.66
Average Earnings per Job (2007 dollars)	\$57,776	\$57,776	\$56,203	\$59,044
<b>Well Completion Impacts</b>				
Direct Employment (jobs/well)	5.28	4.80	2.10	7.50
Total Employment Impact (jobs/well)	8.80	8.00	3.50	12.50
Multiplier (Total Impact/Direct Impact)	1.67	1.67	1.67	1.67
Average Earnings per Job (2007 dollars)	\$58,859	\$58,859	\$58,835	\$59,315
Note: Direct and total employment impact and average earnings per job are calculated using IMPLAN. IMPLAN Impact Analysis for Planning				

Table L.7, “Assumptions for Employment Impacts Analysis for Oil and Gas Production” (p. 1483) shows the direct and total employment impacts associated with production.

**Table L.7. Assumptions for Employment Impacts Analysis for Oil and Gas Production**

<b>Employment Impact (annual number of jobs)</b>	<b>Oil Production (per million barrels)</b>	<b>Gas Production (per billion cubic feet)</b>
Direct Employment	31.7	2.0
Indirect Employment	57.0	3.6
Induced Employment	25.3	1.6
Total Employment	113.9	7.2
Multiplier (Total Impact/Direct Impact)	3.60	3.60
Average Earnings per Job (2007 dollars)	\$55,267	\$55,267
Note: Direct, indirect, and induced employment impact and average earnings per job are calculated using IMPLAN. IMPLAN Impact Analysis for Planning		

The analysis of potential changes in tax revenues is based on tax rates of 12.5 percent of taxable value for federal mineral royalties, 6 percent of taxable value for state severance taxes (Wyoming DOR 2001c), and 7.1 percent of taxable value for local ad valorem production taxes. The average estimated local tax rate is based on average tax rates for the planning area counties: Carbon (6.5 percent), Fremont (7.2 percent), Hot Springs (7.1 percent), Natrona (6.6 percent), and Sweetwater (6.6 percent) (Wyoming DOR 2008). Taxable value refers to value of sales minus allowable deductions, including certain costs of production and transportation. For purposes of estimating tax revenues, taxable value was estimated based on the average taxable value per unit sold from the counties in the planning area for production year 2007 using data from Wyoming Department of Revenue (Wyoming DOR 2008). Taxable value was estimated as \$58.08 per barrel for oil, and \$4.15 per mcf for natural gas (2007 dollars).

## **L.4. Livestock Grazing**

Economic impacts due to changes in livestock grazing are a function of the amount of forage available and the economic value of the forage. For livestock grazing, long-term surface-disturbing actions from actions listed in Appendix T (p. 1535) could affect the authorized animal unit months (AUMs). In addition, land disposal actions could have economic impacts; however, those impacts were not analyzed quantitatively because it is difficult to predict the net change in AUMs. Subsequent landowners may continue to graze the land, leaving overall livestock production and output in the region unaffected.

The economic analysis of livestock grazing impacts is based on a long-term average (from 1989 to 2008) of actual use as a proportion of permitted use. Based on data from the BLM (BLM 2009b), actual use ranged from 51 percent to 89 percent of active use between 1989 and 2008, with an average value of 73 percent. Whereas permitted AUMs include suspended non-use AUMs, actual use represents the AUMs physically used on the ground in a given year. Actual use therefore accounts for the forage value of the land in a given year, based on climatic conditions (e.g., drought), as well as taking into account the needs of the land and the ranch operators as evidenced by how much of their full authorized amount they utilize.

Whereas reductions in land available for livestock grazing (via long-term surface disturbance or grazing withdrawal) are based on permitted AUMs, financial conditions on a given ranch operation are determined by actual use (i.e., the actual forage value of the land that is used for livestock) and authorized use (e.g., bank loans that are based on the available forage value of federal leases held by the ranch operator). Thus, actual use is a more appropriate baseline from which to measure reductions in available AUMs due to surface disturbance or restrictions on

grazing land. If reductions were measured from a baseline of permitted use, economic impacts would be overstated.

Historical analysis of data from the Lander Field Office shows that actual use in the planning area averaged 73 percent of permitted use from 1989 to 2008 (BLM 2009b). Thus, the economic analysis of livestock grazing impacts uses a baseline of 204,993 AUMs, which represents 73 percent of the permitted use of 280,813 AUMs. Reductions in AUMs due to long-term surface disturbance and grazing restrictions are also adjusted for the ratio of actual to permitted use. The 73 percent ratio is used to estimate AUMs and economic impacts for alternatives A, C, and D. For Alternative B, there would be a substantial reduction in permitted AUMs, occurring gradually over time as BLM adjusts permitted AUMs to comply with rangeland health standards. BLM believes that as these adjustments come into effect, operators would increase their actual use relative to permitted use. Therefore, in Alternative B the actual-to-permitted ratio would be somewhat higher, moving gradually from 73 percent in the first year of analysis to 95 percent in the final year of analysis.

Table L.8, “Estimated AUMs by Alternative” (p. 1485) provides a summary of initial AUMs and total AUMs for each alternative. Based on current allocations of AUMs to cattle, sheep, and other species, 91.6 percent of the AUM reduction, for the purpose of estimating changes in output and employment, is allocated to cattle and the remainder is allocated to sheep. (Approximately one percent of AUMs are allocated to horses, and a handful are allocated to goats; the value of these AUMs is assumed to be approximately equivalent to those for cattle and sheep.) BLM presently authorizes 280,813 AUMs for grazing (BLM 2009b).

Under Alternative A, BLM assumes that the present authorization will be affected only by long-term surface disturbance (i.e., due to other surface uses). Under Alternative B, the assumption is that no new range improvements will be constructed and that grazing management will meet Wyoming Standards for Healthy Rangelands. Allotments that are currently meeting standards will not be adjusted. These assumptions result in a decrease in BLM-authorized AUMs in Alternative B. For example, areas of an allotment greater than two miles from a watering facility would not be included in BLM-authorized AUMs under Alternative B, and the BLM would not build new watering facilities to provide water within two miles of these areas. As a result, areas far from an existing watering facility would not count toward BLM-authorized AUMs in Alternative B. Under Alternative C, the BLM would construct range improvements so as to facilitate the maximum number of AUMs to be available for livestock grazing. These assumptions result in somewhat lower AUMs than Alternative A, but more AUMs than in Alternative B (BLM 2010l, BLM 2011). Under Alternative D, the BLM would construct range improvements in a fashion similar to that used for Alternative C and would also close some areas to grazing; nonetheless, surface disturbance under Alternative D would be less than that under Alternative C, so that Alternative D would result in a greater number of AUMs available in 2027. For all alternatives, reductions in AUMs over the 20-year planning horizon were modeled in IMPLAN, based on a gradual reduction over the planning timeline, rather than all at once.

**Table L.8. Estimated AUMs by Alternative**

Item	Alternative A	Alternative B	Alternative C	Alternative D
<b>Permitted AUMs</b>				
Initial AUMs	280,813	280,813	280,813	280,813
AUMs adjusted to meet rangeland health standards	0	149,364	23,432	49,696
AUMs lost due to grazing closures	0	1,873	0	811
AUMs lost from long-term surface-disturbing activities	1,414	853	6,890	1,301
Total AUMs lost (over 20 years)	1,414	152,054	30,322	51,808
AUMs lost per year, total	71	7,603	1,516	2,590
Net AUMs in 2027	279,399	128,759	250,491	229,005
<b>Actual AUMs</b>				
Estimated Percentage of Permitted AUMs	73%	73 to 95% <sup>1</sup>	73%	73%
Estimated Actual Use (2008)	204,993	204,993	204,993	204,993
Estimated Actual Use (2027)	203,962	122,321	182,858	167,173
Source: BLM 2010I, BLM 2011 <sup>1</sup> In Alternative B, the BLM estimates that actual use relative to permitted AUMs will increase from 73 percent to 95 percent gradually over time. Note: Acres (e.g., land affected by surface disturbance) were converted to AUMs based on total acres authorized for grazing and AUMs authorized for grazing.  AUM Animal Unit Month BLM Bureau of Land Management				

Due to price fluctuations, average per-AUM values for cattle and sheep are based on the 1998 to 2007 average value of production estimates from the Wyoming Agricultural Statistics Service (Taylor 2010). The value for cattle is \$44.81 per AUM and the value for sheep is \$43.38 per AUM (in 2007 dollars). Including indirect and induced impacts, the value of one AUM for cattle is \$92.58 and for sheep \$101.58. Table L.9, “Assumptions for Analysis of Impacts on Output for Livestock Grazing” (p. 1486) shows the economic impact assumptions for cattle and sheep. The direct economic impact is the estimated change in livestock output per AUM; IMPLAN generates the indirect and induced impacts.



**Table L.9. Assumptions for Analysis of Impacts on Output for Livestock Grazing**

<b>Economic Impact</b>	<b>Cattle</b>	<b>Sheep</b>
Direct Economic Impact (\$/AUM)	\$44.81	\$43.38
Indirect Economic Impact (\$/AUM) <sup>1</sup>	\$35.98	\$42.94
Induced Economic Impact (\$/AUM) <sup>2</sup>	\$11.76	\$15.61
Total Economic Impact (\$/AUM)	\$92.55	\$101.92
Multiplier (Total Impact/Direct Impact)	2.07	2.35
Note: All dollar values are in 2007 dollars. <sup>1</sup> Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the livestock industry. <sup>2</sup> Induced impacts reflect increased demand in the consumer and government sectors. AUM Animal Unit Month		

Table L.10, “Assumptions for Analysis of Employment Impacts for Livestock Grazing” (p. 1486) provides a summary of the employment impacts according to unit changes in livestock AUMs.

**Table L.10. Assumptions for Analysis of Employment Impacts for Livestock Grazing**

<b>Employment Impact</b>	<b>Cattle</b>	<b>Sheep</b>
Direct Employment (Jobs/1,000 AUMs)	0.466	0.980
Indirect Employment (Jobs/1,000 AUMs)	0.215	0.529
Induced Employment (Jobs/1,000 AUMs)	0.125	0.174
Total Employment (Jobs/1,000 AUMs)	0.806	1.683
Multiplier (Total Impact/Direct Impact)	1.73	1.72
Average Earnings per Job (2007 dollars)	\$33,469	\$17,374
Note: Direct, indirect, and induced employment impacts and average earnings per job are calculated using IMPLAN. AUM Animal Unit Month IMPLAN Impact Analysis for Planning		

## L.5. Recreation

The analysis of economic impacts considers only recreation expenditures of nonresidents of the study area. This is based on the assumption that expenditures of residents would occur in the region regardless of the BLM’s actions that impact recreational opportunities; however, changes in nonresident recreation patterns would alter the amount of money entering the local region.

Economic impacts from recreation are a function of recreation visitor days (RVDs) and expenditures per day. Future RVDs were estimated based on current RVDs, recent growth rates, and projected trends. Estimates of future RVDs were based on the professional judgment of BLM staff (BLM 2010m), as well as a United States (U.S.) Forest Service (USFS) study that provides forecasts of recreation activity for the Rocky Mountain region (Bowker et al. 1999). Table L.11, “Estimated Nonresident Recreation Visitor Days” (p. 1487) provides a summary of estimated annual RVDs.

**Table L.11. Estimated Nonresident Recreation Visitor Days**

Activity	Item	Alternative A	Alternative B	Alternative C	Alternative D
OHV	2008 RVDs	1,283	1,283	1,283	1,283
	2013 RVDs	1,571	1,717	1,487	1,637
	2018 RVDs	1,923	2,298	1,724	2,090
	2023 RVDs	2,354	3,075	1,999	2,667
	2027 RVDs	2,767	3,882	2,250	3,242
	Average Annual Growth Rate	4.1%	6.0%	3.0%	5.0%
Hunting	2008 RVDs	7,900	7,900	7,900	7,900
	2013 RVDs	10,627	11,608	10,627	10,083
	2018 RVDs	14,295	17,056	14,295	12,868
	2023 RVDs	19,230	25,060	19,230	16,424
	2027 RVDs	24,378	34,094	24,378	19,963
	Average Annual Growth Rate	6.1%	8.0%	6.1%	5.0%
Fishing	2008 RVDs	600	600	600	600
	2013 RVDs	774	730	803	842
	2018 RVDs	997	888	1,075	1,180
	2023 RVDs	1,286	1,081	1,438	1,655
	2027 RVDs	1,576	1,264	1,815	2,170
	Average Annual Growth Rate	5.2%	4.0%	6.0%	7.0%
Other Dispersed Recreation	2008 RVDs	66,185	66,185	66,185	66,185
	2013 RVDs	88,871	101,834	84,471	97,247
	2018 RVDs	119,333	156,684	107,808	142,888
	2023 RVDs	160,235	241,078	137,594	209,950
	2027 RVDs	202,842	340,301	167,246	285,635
	Average Annual Growth Rate	6.1%	9.0%	5.0%	8.0%

Source: BLM 2010m

OHV Off-highway vehicle

RVD recreation visitor days

The estimates for average expenditure per visitor day, in 2007 dollars, are \$85.72 for fishing (WGFD 2008, USFWS 2008b); \$130.34 for hunting (Responsive Management 2004); \$52.18 for off-highway vehicle (OHV) use (Foulke et al. 2006), and \$57.71 for other dispersed recreation (Stynes and White 2003). Table L.12, “Assumptions for Analysis of Impacts on Output for Recreation Activities” (p. 1488) shows the direct, indirect, and induced output per RVD for each recreation activity, in 2007 dollars.

**Table L.12. Assumptions for Analysis of Impacts on Output for Recreation Activities**

<b>Economic Impact</b>	<b>OHV (per RVD)</b>	<b>Hunting (per RVD)</b>	<b>Fishing (per RVD)</b>	<b>Other Dispersed (per RVD)</b>
Direct Economic Impact <sup>1</sup>	\$52.18	\$130.34	\$85.72	\$57.71
Indirect Economic Impact <sup>2</sup>	\$7.40	\$31.60	\$11.70	\$8.63
Induced Economic Impact <sup>3</sup>	\$6.11	\$22.72	\$11.19	\$7.26
Total Economic Impact	\$65.69	\$184.67	\$108.61	\$73.60
Multiplier (total impact/direct impact)	1.26	1.42	1.27	1.28

Sources: WGFD 2008, USFWS 2008b, Responsive Management 2004, Foulke et al. 2006, Stynes and White 2003, Taylor 2010.  
Note: Detail may not add to total due to rounding.  
<sup>1</sup>Direct economic impact is the average expenditure per visitor day.  
<sup>2</sup>Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide support for the recreation industry.  
<sup>3</sup>Induced impacts from IMPLAN reflect increased demand in the consumer and government sectors.

IMPLAN Impact Analysis for Planning  
OHV Off-highway vehicle  
RVD recreation visitor day

Table L.13, “Assumptions for Employment Impacts Analysis for Recreation Activities” (p. 1488) provides a summary of employment impacts assumed according to unit changes in RVDs.

**Table L.13. Assumptions for Employment Impacts Analysis for Recreation Activities**

<b>Employment Impact (annual number of jobs)</b>	<b>OHV (per 1,000 RVDs)</b>	<b>Hunting (per 1,000 RVDs)</b>	<b>Fishing (per 1,000 RVDs)</b>	<b>Other Dispersed (per 1,000 RVDs)</b>
Direct Employment	0.58	1.89	1.02	0.64
Indirect Employment	0.06	0.26	0.09	0.07
Induced Employment	0.06	0.22	0.10	0.07
Total Employment	0.70	2.37	1.22	0.78
Multiplier (Total Impact/Direct Impact)	1.21	1.26	1.19	1.22
Average Earnings per Job (2007 dollars)	\$20,486	\$22,399	\$21,547	\$21,858

Note: Direct, indirect, and induced employment impact and average earnings per job are calculated using IMPLAN.

IMPLAN Impact Analysis for Planning  
OHV Off-highway vehicle  
RVD recreation visitor day

# **Appendix M. Wyoming BLM Mitigation Guidelines for Surface-Disturbing and Disruptive Activities**

Wyoming Mitigation Guidelines are a compilation of practices employed by the Bureau of Land Management (BLM) to mitigate impacts from surface disturbance. They apply to activities such as road or pipeline construction, range improvements, and permitted recreation activities. The guidelines are designed to protect resources such as soils and vegetation, wildlife habitat, and cultural or historic properties. The guidelines are presented as an appendix of the Resource Management Plan (RMP) and Environmental Impact Statement (EIS) for easy reference as they apply to many resources and derive from many laws. All BLM RMPs have included these guidelines as appendices. Public comment on the guidelines, per se, has not been requested. The guidelines are not land use decisions; rather they are examples of mitigation measures that could be applied, as appropriate, based on site-specific National Environmental Policy Act (NEPA) analysis for individual proposals. Comment on the use and application of specific mitigation measures can be made during the NEPA process for individual proposals. Because mitigation measures change or are modified, based on new information, the guidelines are updated periodically for all field offices in Wyoming.

These guidelines are primarily for the purpose of attaining statewide consistency in how requirements are determined for avoiding and mitigating environmental impacts and resource and land use conflicts. Consistency in this sense does not mean that identical requirements would be applied for all similar types of land use activities that may cause similar types of impacts. Nor does it mean that the requirements or guidelines for a single land use activity would be identical in all areas.

There are two ways the mitigation guidelines are used in the RMP and EIS process: (1) as part of the planning criteria in developing the RMP alternatives; and (2) in the analytical processes of both developing the alternatives and analyzing the impacts of the alternatives. In the first case, an assumption is made that any one or more of the mitigations will be appropriately included as conditions of relevant actions being proposed or considered in each alternative. In the second case, the mitigations are used (1) to develop a baseline for measuring and comparing impacts among the alternatives; (2) to identify other actions and alternatives that should be considered; and (3) to help determine whether more stringent or less stringent mitigations should be considered.

The EIS for the RMP does not decide or dictate the exact wording or inclusion of these guidelines. Rather, the guidelines are used in the RMP and EIS process as a tool to help develop the RMP alternatives and to provide a baseline for comparative impact analysis in arriving at RMP decisions. These guidelines will be used in the same manner in analyzing activity plans and other site-specific proposals. These guidelines and their wording are matters of policy. As such, specific wording is subject to change primarily through administrative review, not through the RMP and EIS process. Any further changes that may be made in the continuing refinement of these guidelines and any development of program-specific standard stipulations will be handled in another forum, including appropriate public involvement and input.

## **PURPOSE**

The purposes of the “Wyoming BLM Mitigation Guidelines” are (1) to reserve, for the BLM, the right to modify the operations of all surface and other human presence disturbance activities as part of the statutory requirements for environmental protection; and (2) to inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands. These guidelines have been written in a format that will allow for (1) their direct use as stipulations, and (2) the addition of specific or specialized mitigation following the submission of a detailed plan of development or other project proposal and an environmental analysis.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the mitigation guidelines as stipulations or as conditions of approval, or as a baseline for developing specific stipulations for a given activity or program.

Because use of the mitigation guidelines was integrated into the RMP and EIS process and will be integrated into the site-specific environmental analysis process, the application of stipulations or mitigation requirements derived through the guidelines will provide more consistency with planning decisions and plan implementation than has occurred in the past. Application of the mitigation guidelines to all surface and other human presence disturbance activities concerning BLM-administered public lands and resources will provide more uniformity in mitigation than has occurred in the past.

## **MITIGATION GUIDELINES**

### **Surface Disturbance Mitigation Guideline**

Surface disturbance will be prohibited in any of the following areas or conditions. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- Slopes in excess of 25 percent
- Within important scenic areas (Visual Resource Management Class I and II areas)
- Within 500 feet of surface water and/or riparian areas
- Within either ¼ mile or the visual horizon (whichever is closer) of historic trails
- Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur

### ***Guidance***

The intent of the surface disturbance mitigation guideline is to inform interested parties (potential lessees, permittees, or operators) that when one or more of the five conditions exist, surface-disturbing activities will be prohibited unless or until a permittee or his designated representative and the surface management agency arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development.

Specific criteria (e.g., 500 feet from water) have been established based upon the best information available. However, specific geographical areas and seasons must be delineated at the field level. Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of the proposal (e.g., activity plan, plan of development, Plan of

Operation, and Application for Permit to Drill [APD]) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

### **Wildlife Mitigation Guideline**

- A. To protect important big game winter habitat, activities or surface use will not be allowed from November 15 to April 30 within certain areas encompassed by the authorization. The same criteria apply to defined big game birthing areas from May 1 to June 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- B. To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, activities or surface use will not be allowed from February 1 to July 31 within certain areas encompassed by the authorization. The same criteria apply to defined raptor and game bird winter concentration areas from November 15 to April 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- C. No activities or surface use will be allowed on that portion of the authorization area identified within (legal description) for the purpose of protecting (e.g., sage/sharp-tailed grouse breeding grounds, and/or other species/activities) habitat.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

- D. Portions of the authorized use area legally described as (legal description), are known or suspected to be essential habitat for (name) which is a threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and U.S. Fish and Wildlife Service guidelines to verify the presence or absence of this species. In the event that (name) occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., seasonal use restrictions, occupancy limitations, facility design modifications).

### **Guidance**

The Wildlife Mitigation Guideline is intended to provide two basic types of protection: seasonal restriction and prohibition of activities or surface use (2c). Item 2d is specific to situations involving threatened or endangered species. Legal descriptions will ultimately be required and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based upon current biological data, prior to the time of processing an application and issuing the use authorization. The legal description must eventually become a part of the condition for approval of the permit, plan of development, and/or other use authorization.

The seasonal restriction section identifies three example groups of species and delineates three similar timeframe restrictions. The big game species including elk, moose, deer, pronghorn, and bighorn sheep, all require protection of crucial winter range between November 15 and April 30. Elk and bighorn sheep also require protection from disturbance from May 1 to June 30, when they typically occupy distinct calving and lambing areas. Raptors include eagles, accipiters, falcons (peregrine, prairie, and merlin), buteos (ferruginous and Swainson's hawks), osprey, and burrowing owls. The raptors and sage and sharp-tailed grouse require nesting protection between February 1 and July 31. The same birds often require protection from disturbance from November 15 through April 30 while they occupy winter concentration areas.

Item 2c, the prohibition of activity or surface use, is intended for protection of specific wildlife habitat areas or values within the use area that cannot be protected by using seasonal restrictions. These areas or values must be factors that limit life-cycle activities (e.g., sage-grouse strutting grounds, known threatened and endangered species habitat).

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of the proposal (e.g., activity plan, plan of development, Plan of Operation, APD) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

## **Cultural Resource Mitigation Guideline**

When a proposed discretionary land use has potential for affecting the characteristics which qualify a cultural property for the National Register of Historic Places (NRHP), mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 Code of Federal Regulations (CFR) 800 will be used in consultation with the Wyoming State Historic Preservation Officer and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation to be required.

### ***Guidance***

The preferred strategy for treating potential adverse effects on cultural properties is "avoidance." If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM Manuals, the cultural resource permit stipulations, and in other policy issued by the BLM. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate BLM cultural resource specialist. If cultural properties on, or eligible for, the NRHP are located within these areas of potential impact and cannot be avoided, the Authorized Officer shall begin the Section 106 consultation process in accordance with the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM Authorized Officer. Such plans are usually prepared by the land use applicant according to BLM specifications. Mitigation plans will be reviewed as part of Section 106 consultation for NRHP eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate with the significance of the cultural resource involved and the anticipated extent of

damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be BLM approved or BLM formulated.

Mitigation of paleontological and natural history sites will be treated on a case-by-case basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values is provided for in the Federal Land Policy and Management Act, Section 102(a)(8). When avoidance is not possible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

### **Special Resource Mitigation Guideline**

To protect (resource value), activities or surface use will not be allowed (i.e., within a specific distance of the resource value or between date to date) in (legal description).

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

Example Resource Categories (Select or identify category and specific resource value):

- a. Recreation areas
- b. Special natural history or paleontological features
- c. Special management areas
- d. Sections of major rivers
- e. Prior existing rights-of-way
- f. Occupied dwellings
- g. Other (specify)

### **Guidance**

The *Special Resource Mitigation Guideline* is intended for use only in site-specific situations where one of the first three general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, APD) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

### **No Surface Occupancy Guideline**



No Surface Occupancy (NSO) will be allowed on the following described lands (legal description) because of (resource value).

Example Resource Categories (Select or identify category and specific resource value):

- a. Recreation Areas (e.g., campgrounds, historic trails, national monuments)
- b. Major reservoirs/dams
- c. Special management area (e.g., known threatened or endangered species habitat, areas suitable for consideration for wild and scenic rivers designation)
- d. Other (specify)

### ***Guidance***

The *No Surface Occupancy Mitigation Guideline* is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the only alternative to “no development” or “no leasing.” The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of, or exception(s) to, the NSO requirement will be subject to the same test used to initially justify its imposition. If, upon evaluation of a site-specific proposal, it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then a waiver or exception to the NSO requirement is possible. The record must show that because conditions or uses have changed, less restrictive requirements will protect the public interest. An environmental analysis must be conducted and documented (e.g., environmental assessment, environmental impact statement, etc., as necessary) in order to provide the basis for a waiver or exception to an NSO planning decision. Modification of the NSO requirement will pertain only to refinement or correction of the location(s) to which it applied. If the waiver, exception, or modification is found to be consistent with the intent of the planning decision, it may be granted. If found inconsistent with the intent of the planning decision, a plan amendment would be required before the waiver, exception, or modification could be granted.

When considering the “no development” or “no leasing” option, a rigorous test must be met and fully documented in the record. This test must be based upon stringent standards described in the land use planning document. Since rejection of all development rights is more severe than the most restrictive mitigation requirement, the record must show that consideration was given to development subject to reasonable mitigation, including “no surface occupancy.” The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest. A “no development” or “no leasing” decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.

# Appendix N. Standard Oil and Gas Stipulations

Operations will not be approved which, in the opinion of the Authorized Officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

## Lease Notice 1

Under Regulation 43 Code of Federal Regulations (CFR) 3101.1 2 and terms of the lease (Bureau of Land Management [BLM] Form 3100 11), the Authorized Officer may require reasonable measures to minimize adverse impacts to other resource values, land uses, and users not addressed in lease stipulations at the time operations are proposed. Such reasonable measures may include, but are not limited to, modification of siting or design of facilities, timing of operations, and specification of interim and final reclamation measures, which may require relocating proposed operations up to 200 meters, but not off the leasehold, and prohibiting surface disturbance activities for up to 60 days.

The lands within this lease may include areas not specifically addressed by lease stipulations that may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or other resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled or, if absolutely necessary, prohibited. Appropriate modifications to imposed restrictions will be made for the maintenance and operation of producing wells.

1. Slopes in excess of 25 percent
2. Within 500 feet of surface water and/or riparian-wetland areas
3. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur
4. Within 500 feet of Interstate highways and 200 feet of other existing rights of way (i.e., United States [U.S.] and State highways, roads, railroads, pipelines, powerlines)
5. Within ¼ mile of occupied dwellings
6. Material sites

## Guidance

The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when one or more of the above conditions exist, surface-disturbing activities will be prohibited unless or until the permittee or the designated representative and the surface management agency arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

Specific threshold criteria (e.g., 500 feet from water) have been established based upon the best information available. However, geographical areas and time periods of concern must be delineated at the field level (i.e., “surface water and/or riparian areas” may include both intermittent and ephemeral water sources or may be limited to perennial surface water).

The referenced oil and gas leases on these lands are hereby made subject to the stipulation that the exploration or drilling activities will not interfere materially with the use of the area as a materials site/free use permit. At the time operations on the above lands are commenced, notification will be made to the appropriate agency. The name of the appropriate agency may be obtained from the proper BLM Field Office.

## **Lease Notice 2**

### ***Background***

The BLM, by including National Historic Trails (NHTs) within its National Landscape Conservation System, has recognized these trails as national treasures. Our responsibility is to review the strategy for management, protection, and preservation of these trails. The NHTs in Wyoming, which include the Oregon, California, Mormon Pioneer, and Pony Express Trails, as well as the Nez Perce Trail, were designated by Congress through the National Trails System Act (Public Law [P.L.] 90-543; 16 United States Code [U.S.C.] 1241-1251) as amended through P.L. 106-509 dated November 13, 2000. Protection of the NHTs is normally considered under the National Historic Preservation Act (NHPA) (P.L. 89-665; 16 U.S.C. 470 et seq.) as amended through 1992 and the National Trails System Act. Additionally, Executive Order 13195, "Trails for America in the 21st Century," signed January 18, 2001, states in Section 1: "Federal agencies will ... protect, connect, promote, and assist trails of all types throughout the U.S.. This will be accomplished by ... (b) Protecting the trail corridors associated with national scenic trails and the high priority potential sites and segments of national historic trails to the degrees necessary to ensure that the values for which each trail was established remain intact." Therefore, the BLM will be considering all impacts and intrusions to the NHTs, their associated historic landscapes, and all associated features, such as trail traces, grave sites, historic encampments, inscriptions, natural features frequently commented on by emigrants in journals, letters and diaries, or any other feature contributing to the historic significance of the trails. Additional NHTs will likely be designated amending the National Trails System Act. When these amendments occur, this notice will apply to those newly designated NHTs as well.

### ***Strategy***

The BLM will proceed in this objective by conducting a viewshed analysis on either side of the designated centerline of the NHTs in Wyoming, except, at this time, for the Nez Perce Trail, for the purpose of identifying and evaluating potential impacts to the trails, their associated historic landscapes, and their associated historic features. Subject to the viewshed analysis and archeological inventory, reasonable mitigation measures may be applied. These may include, but are not limited to, modification of siting or design of facilities to camouflage or otherwise hide the proposed operations within the viewshed. Additionally, specification of interim and final reclamation measures may require relocating the proposed operations within the leasehold. Surface-disturbing activities will be analyzed in accordance with the National Environmental Policy Act of 1969 (P.L. 91-190; 42 U.S.C. 4321-4347) as amended through P.L. 94-52, July 3, 1975 and P.L. 94-83, August 9, 1975, and the NHPA, *supra*, to determine if any design, siting, timing, or reclamation requirements are necessary. This strategy is necessary until the BLM determines that, based on the results of the completed viewshed analysis and archeological inventory, the existing land use plans (Resource Management Plans) have to be amended.

The use of this lease notice is a predecisional action, necessary until final decisions regarding surface-disturbing restrictions are made. Final decisions regarding surface-disturbing restrictions

will take place with full public disclosure and public involvement over the next several years if BLM determines that it is necessary to amend existing land use plans.

### ***Guidance***

The intent of this notice is to inform interested parties (potential lessees, permittees, operators) that when any oil and gas lease contains remnants of NHTs, or is located within the viewshed of an NHT's designated centerline, surface-disturbing activities will require the lessee, permittee, operator or, their designated representative, and the surface management agency to arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

## **Attachment to Each Lease**

### ***Notice to Lessee***

Provisions of the Mineral Leasing Act (MLA) of 1920, as amended by the Federal Coal Leasing Amendments Act of 1976, affect an entity's qualifications to obtain an oil and gas lease. Section 2(a)(2)(A) of the MLA, 30 U.S.C. 201 (a)(2)(A), requires that any entity that holds and has held a federal coal lease for 10 years beginning on or after August 4, 1976, and who is not producing coal in commercial quantities from each such lease, cannot qualify for the issuance of any other lease granted under the MLA. Compliance by coal lessees with Section 2(a)(2)(A) is explained in 43 CFR 3472.

In accordance with the terms of this oil and gas lease, with respect to compliance by the initial lessee with qualifications concerning federal coal lease holdings, all assignees and transferees are hereby notified that this oil and gas lease is subject to cancellation if: (1) the initial lessee as assignor or as transferor has falsely certified compliance with Section 2(a)(2)(A), or (2) because of a denial or disapproval by a State Office of a pending coal action, i.e., arms-length assignment, relinquishment, or logical mining unit, the initial lessee as assignor or as transferor is no longer in compliance with Section 2(a)(2)(A). The assignee, sublessee or transferee does not qualify as a bona fide purchaser and, thus, has no rights to bona fide purchaser protection in the event of cancellation of this lease due to noncompliance with Section 2(a)(2)(A).

Information regarding assignor, sublessor or transferor compliance with Section 2(a)(2)(A) is contained in the lease case file as well as in other BLM records available through the State Office issuing this lease.

## Appendix O. Fire Management

Table O.1, “Fire Management by Fire Management Unit” (p. 1500) provides a description of fire management by Fire Management Units within the planning area.

Table O.1. Fire Management by Fire Management Unit

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
<b>Green and Crooks Mountain FMU</b>	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Use prescribed fire treatments to create a vegetative mosaic and maintain natural openings in the mountain shrub habitat within the FMU. Emphasis on the mountain shrub communities (mountain sagebrush, bitterbrush, snowberry, buckbrush and other associates shrubs) and marginal timbered communities, including areas where there is declining health of aspen stands.	Multi-year stated treatments will be utilized to revitalize aspen stands and to improve and maintain forest health in conifer-timbered communities.	Post-fire rehabilitation and restoration of wildfires will be initiated to allow reestablishment of native plant communities and to stabilize erosive soil conditions on a case-by-case basis.	Coordinate fuels reduction plans and actions with private land and homeowners to significantly reduce the likelihood of landscape-level fire within the WUI and thereby enhance public safety.	Initiate prescribed burning in the next 10 years on approximately 1,500 acres within mountain shrub and marginal timer communities to improve wildlife habitat, create opening in vegetation communities with conifer encroachment, restore aspen stands that are decadent and in declining health, and reduce hazardous fuels. A portion of the 1,500 acres may also be treated with mechanical, manual chemical, or biological methods.	Restoration and rehabilitation will emphasize the reestablishment of habitat diversity and ecosystem health on a case-by-case basis. Site-specific projects will be considered to meet the objectives as identified in the Resource Management Plan.
<b>Sweetwater Valley FMU</b>	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife	Allow fire use to protect, maintain, and enhance resources, and as nearly as possible, be allowed to function in its natural ecological role. Use of prescribed fire is desired to	Chemical and various methods of mechanical treatments are planned within this FMU over the next 10 years to improve sagebrush-grassland health and to allow greater	Post-fire rehabilitation and restoration of wildlands fires would be initiated, if necessary, to protect and sustain ecosystems, public health, safety, and to help communities	There are no identified communities at risk in this FMU.	Initiate prescribed burning on approximately 20,000 acres of sagebrush-grassland and marginal timbered communities in the next 10 years to reduce fuels and encourage	Post-fire rehabilitation and restoration of wildfires would be initiated, if necessary, to protect and sustain ecosystems, public health, safety, and to help communities

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
	habitat, watersheds, etc.).	reintroduce fire into the ecosystem. Create and maintain a vegetative mosaic across the landscape. Air quality objectives would be met.	water infiltration into the soil.	protect infrastructure.		restoration of ecosystem health. A portion of the 20,000 acres may also be treated with mechanical, manual chemical, or biological methods.	protect infrastructure.
<b>Rattlesnake Hills FMU</b>	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Allow fire use to protect, maintain, and enhance resources, and as nearly as possible, be allowed to function in its natural ecological role. Use of prescribed fire is desired to reintroduce fire into the ecosystem. Create and maintain a vegetative mosaic across the landscape. Air quality objectives would be met.	Chemical and various methods of mechanical treatments will be considered, as needed, by a site-specific plan to create uneven aged vegetative mosaics within sagebrush-grasslands and to improve diversity of herbaceous species and regeneration of decadent aspen stands.	Evaluate the need for rehabilitation or restoration work following disturbances focusing on immediate reestablishment of native vegetation species suited to local range sites.	There are no identified communities at risk (as listed on the Federal Register) in this FMU. Work closely with homeowners, ranchers, and communities in the FMU to develop and implement hazardous fuels reduction projects on public lands adjacent to private lands and structures at risk in the event of a landscape-level wildland fire.	Initiate prescribed burning on approximately 12,000 acres of sagebrush-grassland communities (primarily improvement of mountain shrub habitat and restoration of aspen stands) over the next 10 years to reduce fuels and encourage restoration of ecosystem health. A portion of the 12,000 acres may also be treated with mechanical, manual chemical, or biological methods.	Projects will be identified on an as-needed basis to reestablish native vegetation species.

<b>FMU</b>	<b>Suppression Objectives</b>	<b>Use of Wildland Fire and Prescribed Fire</b>	<b>Non-Fire Fuels Treatments Objectives</b>	<b>Post-Fire Rehabilitation and/or Restoration Objectives</b>	<b>Community Protection/Community Assistance</b>	<b>Prescribed Fire/Non-Fire Fuels Treatments</b>	<b>Restoration and Rehabilitation</b>
<b>Lander Slope FMU</b>	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Use prescribed fire to re-introduce fire into the ecosystem. Use prescribed fire treatments to create a vegetative mosaic and limit the extent of conifer encroachment into sagebrush/mountain shrub communities, and rejuvenate older aspen stand and promote aspen regeneration. Use prescribed fire in the form of pile burning to reduce the hazardous fuel build-up created by thinning near communities and sub-divisions and also created by cutting conifers of vegetative communities. Air quality objectives would be met.	Chemical and various methods of mechanical treatments will be considered, as needed, by a site-specific plan to create uneven aged vegetative mosaics.	Evaluate the need for rehabilitation or restoration work following disturbances focusing on immediate reestablishment of native vegetation species suited to local range sites.	Reduce fire risk to WUI communities. Develop risk assessment and mitigation plans for public and private lands.	Initiate prescribed burning on approximately 2,500 acres for hazardous fuels reduction, aspen regeneration, restoration of ecosystem health in mountain shrub habitat (mountain sagebrush, biggerbrush, serviceberry and other associated shrubs), and burning of slab piles produced from mechanical vegetation treatments over the next 10 years to reduce fuels and encourage restoration of ecosystem health. A portion of the 2,500 acres may also be treated with mechanical, manual chemical, or biological methods.	Projects will be identified on an as-needed basis to reestablish native vegetation species.



FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
<b>Copper Mountain FMU</b>	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Allow fire use to protect, maintain, and enhance resources, and as nearly as possible be allowed to function in its natural ecological role. Use of prescribed fire is desired to re-introduce fire into the ecosystem. Create and maintain a vegetative mosaic and limit the extent of conifer encroachment into sagebrush/mountain shrub communities. Air quality objectives would be met.	Chemical and various methods of mechanical treatments will be considered, as needed, by a site-specific plan to create uneven aged vegetative mosaics.	Evaluate the need for rehabilitation or restoration work following disturbances focusing on immediate reestablishment of native vegetation species suited to local range sites.	Currently, there are no identified communities at risk in this FMU (as listed in the Federal Register).	Initiate prescribed burning on approximately 5,600 acres over the next 10 years of mountain sagebrush-grassland communities to treat sagebrush steppe with juniper encroachment, hazardous fuels reduction and aspen regeneration. A portion of the 5,600 acres may also be treated with mechanical, manual chemical, or biological methods.	Post-fire rehabilitation and restoration of wildfires would be initiated, if necessary, to protect and sustain ecosystems, public health, safety and to help communities protect infrastructure.
<b>Dubois FMU</b>	Firefighter and public safety, protection of communities, development and improvements, and protection of resources (e.g., cultural, wildlife habitat, watersheds, etc.).	Create and maintain a vegetative mosaic across the landscape. Emphasis on the mountain shrub communities and marginal timbered communities, including area where there is declining health of aspen stands.	Multi-year stated treatments will be utilized to revitalize aspen stands, rejuvenate shrub communities, and to improve and maintain forest health.	Depending upon the size and intensity of the burn, post-fire rehabilitation and restoration of wildfires will be initiated to allow reestablishment of native plant communities and to stabilize erosive soil conditions.	Coordinate fuels reduction plans and actions with Dubois and Union Pass communities to significantly reduce the likelihood of landscape-level fire within the WUI and to lower the risk of danger to public safety. Develop risk assessment and fire defense plan for	Initiate prescribed burning on approximately 2,400 acres over the next 10 years of mountain shrub and marginal timber communities for hazardous fuels reduction as well as restoring ecosystem health (aspen regeneration, treating areas	Post-fire rehabilitation and restoration of wildfires would be initiated, if necessary, to protect and sustain ecosystems, public health, safety, and to help communities protect infrastructure.

FMU	Suppression Objectives	Use of Wildland Fire and Prescribed Fire	Non-Fire Fuels Treatments Objectives	Post-Fire Rehabilitation and/or Restoration Objectives	Community Protection/Community Assistance	Prescribed Fire/Non-Fire Fuels Treatments	Restoration and Rehabilitation
					public lands in the Dubois WUI area.	of conifer encroachment and wildlife habitat improvement) and burning slash piles produced by mechanical operations and timber harvest. A portion of the 2,400 acres may also be treated with mechanical, manual chemical, or biological methods.	
FMU Fire Management Unit WUI Wildland Urban Interface							

# Appendix P. Species Mentioned in the Lander Field Office Resource Management Plan and Environmental Impact Statement

Table P.1. Common and Scientific Names of Plant and Wildlife Species

Common Name	Scientific Name
<b>Plants</b>	
Aspen	<i>Populus tremuloides</i>
Barneby's clover	<i>Trifolium barnebyi</i>
Beaver Rim phlox	<i>Phlox pungens</i>
Big sagebrush	<i>Artemisia tridentata</i>
Black henbane	<i>Hyoscyamus niger</i>
Blowout penstemon	<i>Penstemon haydenii</i>
Buffalobur	<i>Solanum rostratum</i>
Bull thistle	<i>Cirsium vulgare</i>
Canada thistle	<i>Cirsium arvense</i>
Cedar Rim thistle	<i>Cirsium aridum</i>
Cheatgrass/downy brome	<i>Bromus tectorum</i>
Chokecherry	<i>Prunus virginiana</i>
Common burdock	<i>Arctium minus (Hill) Bernh.</i>
Common cocklebur	<i>Xanthium sp.</i>
Common St. Johnswort	<i>Hypericum perforatum</i>
Common tansy	<i>Tanacetum vulgare</i>
Cottonwood	<i>Populus spp.</i>
Curlycup gumweed	<i>Grindelia squarrosa</i>
Dalmation toadflax	<i>Linaria genistifolia ssp. dalmatica</i>
Desert yellowhead	<i>Yermo xanthocephalus</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Douglas fir	<i>Pseudotsuga menziesii</i>
Dubois milkvetch	<i>Astragalus gilviflorus var. purpureus</i>
Dwarf mistletoe	<i>Arceuthobium spp.</i>
Dyer's woad	<i>Isatis tinctoria</i>
Field bindweed	<i>Convolvulus arvensis</i>
Foxtail barley	<i>Hordeum jubatum</i>
Fremont bladderpod	<i>Lesquerella fremontii</i>
Greasewood	<i>Sarcobatus vermiculatus</i>
Halogeton	<i>Halogeton glomeratus</i>
Hoary cress (whitetro)	<i>Cardaria draba and Cardaria pubescens Desv.</i>
Houndstongue	<i>Cynoglossum officinale</i>
Indian paintbrush	<i>Castilleja spp.</i>
Lady's bedstraw	<i>Galium verum</i>
Larkspur	<i>Delphinium occidentale</i>
Leafy spurge	<i>Euphorbia esula</i>
Limber pine	<i>Pinus flexilis</i>
Locoweed	<i>Astragalus spp.</i>
Locoweed	<i>Oxytropis spp.</i>
Lodgepole pine	<i>Pinus contorta</i>
Lupine	<i>Lupinus spp.</i>
Meadow pussytoes	<i>Antennaria arcuata</i>
Mistletoe	<i>Arceuthobium spp.</i>
Mountain thermopsis	<i>Thermopsis montana</i>

Appendix P Species Mentioned in the Lander  
Field Office Resource Management Plan and  
Environmental Impact Statement

Common Name	Scientific Name
Musk thistle	<i>Carduus nutans</i>
Mustard	<i>Brassicaceae spp.</i>
Nelson's milkvetch	<i>Astragalus nelsonianus</i>
Owl Creek miner's candle	<i>Cryptantha subcapitata</i>
Ox-eye daisy	<i>Leucanthemum vulgare</i> or <i>Chrysanthemum leucanthemum</i>
Perennial pepperweed (giant whitetop)	<i>Lepidium latifolium</i>
Perennial sowthistle	<i>Sonchus arvensis</i>
Persistent sepal yellowcress	<i>Rorippa calycina</i>
Phlox	<i>Phlox spp.</i>
Plains larkspur / Geyer larkspur	<i>Delphinium geyeri</i>
Plains prickly pear	<i>Opuntia polyacantha</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Ponderosa pine	<i>Pinus ponderosa</i>
Poplar bud-gall mite	<i>Eriophes parapopuli</i>
Porter's sagebrush	<i>Artemisia porteri</i>
Puncturevine	<i>Tribulus terrestris</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Quackgrass	<i>Agropyron repens</i>
Rocky Mountain juniper	<i>Juniperus scopulorum</i>
Rocky Mountain twinpod	<i>Physaria saximontana</i> var. <i>saximontana</i>
Rush	<i>Juncus spp.</i>
Russian knapweed	<i>Acroptilon repens</i> (synonym = <i>Centaurea repens</i> )
Russian olive	<i>Elaeagnus angustifolia</i>
Russian thistle	<i>Salsola tragus</i>
Sagebrush	<i>Artemisia spp.</i>
Salt cedar	<i>Tamarix spp.</i>
Scotch thistle	<i>Onopordum acanthium</i>
Sedge	<i>Carex spp.</i>
Shoshonea	<i>Shoshonea pulvinata</i>
Showy milkweed	<i>Asclepias speciosa</i>
Skeletonleaf bursage	<i>Franseria discolor</i>
Spotted knapweed	<i>Centaurea maculosa</i>
Sulfur cinquefoil	<i>Potentilla recta</i>
Swainsonpea	<i>Sphaerophysa salsula</i>
Tumble mustard	<i>Thelypodopsis spp.</i>
Utah juniper	<i>Juniperus osteosperma</i>
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>
Water birch	<i>Betula occidentalis</i>
Wild licorice	<i>Glycyrrhiz lepidota</i>
Willow	<i>Salix spp.</i>
Wyeth lupine	<i>Lupinus wyethii</i>
Yellow toadflax	<i>Linaria vulgaris</i>
<b>Fungi</b>	
Blister rust or white pine blister rust	<i>Cronartium ribicola</i>
<b>Fish</b>	
Bear River cutthroat	<i>Oncorhynchus clarki utah</i>
Black bullhead	<i>Ameirus melas</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Bluegill	<i>Lepomis macrochirus</i>
Brook trout	<i>Salvelinus fontinalis</i>
Brown trout	<i>Salmo trutta</i>
Burbot	<i>Lota lota</i>
Channel catfish	<i>Ictalurus punctatus</i>

Common Name	Scientific Name
Common carp [Carp in text]	<i>Cyprinus carpio</i>
Creek chub	<i>Semotilus atromaculatus</i>
Cutthroat trout	<i>Oncorhynchus clarki</i>
Emerald shiner	<i>Notropis atherinoides</i>
Fathead minnow	<i>Pimephales promelas</i>
Flathead chub	<i>Platygobio gracilis</i>
Golden shiner	<i>Notemigonus crysoleucas</i>
Grass carp	<i>Ctenopharyngodon idella</i>
Green sunfish (Green Sunfish - Bluegill Hybrid)	<i>Lepomis cyanellus</i>
Iowa darter	<i>Etheostoma exile</i>
Johnny darter	<i>Etheostoma nigrum</i>
Lake chub	<i>Couesius plumbeus</i>
Lake trout	<i>Salvelinus namaycush</i>
Largemouth bass	<i>Micropterus salmoides</i>
Longnose dace	<i>Rhinichthys cataractae</i>
Longnose sucker	<i>Catostomus catostomus</i>
Mottled Sculpin	<i>Cottus bairdi</i>
Mountain sucker	<i>Catostomus platyrhynchus</i>
Mountain whitefish	<i>Prosopium williamsoni</i>
Plains killifish	<i>Fundulus zebrinus</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
River carpsucker	<i>Carpionodes carpio</i>
Sand shiner	<i>Notropis stramineus</i>
Sauger	<i>Sander canadensis</i>
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>
Snake River cutthroat	<i>Oncorhynchus clarki</i> spp.
Splake (brook and lake trout hybrid)	<i>Salvelinus namaycush</i> X <i>Salvelinus fontinalis</i>
Spottail shiner	<i>Notropis hudsonius</i>
Stonecat	<i>Noturus flavus</i>
Tiger muskie (Muskellunge and Northern Pike hybrid)	<i>Esox lucius</i> X <i>Esox masquinongy</i>
Walleye	<i>Sander vitreus</i>
White crappie	<i>Pomoxis annularis</i>
White sucker	<i>Catostomus commersoni</i>
Yellow perch	<i>Perca flavescens</i>
Yellowstone cutthroat trout	<i>Oncorhynchus clarki bouvieri</i>
<b>Wildlife</b>	
Badger	<i>Taxidea taxus</i>
Baird's sparrow	<i>Ammodramus bairdii</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Beaver	<i>Castor canadensis</i>
Beet leafhopper	<i>Circulifer tenellus</i>
Bighorn sheep	<i>Ovis canadensis</i>
Bison	<i>Bison bison</i>
Black bear	<i>Ursus americanus</i>
Black-footed ferret	<i>Mustela nigripes</i>
Blue grouse	<i>Dendragapus obscurus</i>
Bobcat	<i>Lynx rufus</i>
Boreal chorus frog	<i>Pseudacris triseriata</i>
Boreal toad (Rocky Mountain population)	<i>Bufo boreas boreas</i>
Brewer's sparrow	<i>Spizella breweri</i>
Bull snake	<i>Pituophis catenifer</i>
Burrowing owl	<i>Speotyto cunicularia</i>
Canada lynx	<i>Lynx canadensis</i>

<b>Common Name</b>	<b>Scientific Name</b>
Chukar partridge	<i>Alectoris chukar</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Coot	<i>Fulica spp.</i>
Cottontail rabbit	<i>Sylvilagus spp.</i>
Coyote	<i>Canis latrans</i>
Ducks and geese	<i>family Anatidae</i>
Dwarf shrew	<i>Sorex nanus</i>
Eastern yellow-bellied racer	<i>Coluber constrictor flaviventris</i>
Elk	<i>Cervus elaphus</i>
Ferruginous hawk	<i>Buteo regalis</i>
Golden eagle	<i>Aquila chrysaetos</i>
Goshawk	<i>Accipiter gentilis</i>
Gray wolf	<i>Canis lupus</i>
Great Basin spadefoot toad	<i>Spea intermontana</i>
Great gray owl	<i>Strix nebulosa</i>
Great horned owl	<i>Bubo virginianus</i>
Greater sage-grouse	<i>Centrocercus urophasianus</i>
Greater short-horned lizard	<i>Phrynosoma hernandesi</i>
Grizzly bear	<i>Ursus arctos horribilis</i>
Ground squirrel	<i>Spermophilus sp.</i>
Hungarian partridge	<i>Perdix perdix</i>
Intermountain wandering gartersnake	<i>Thamnophis elegans vagrans</i>
Kestrel	<i>Falco spp.</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Long-billed curlew	<i>Numenius americanus</i>
Long-eared myotis	<i>Myotis evotis</i>
Long-eared owl	<i>Asio otus</i>
Marten	<i>Martes sp.</i>
Merlin	<i>Falco columbarius</i>
Mink	<i>Mustela vison</i>
Moose	<i>Alces alces</i>
Mountain lion	<i>Puma concolor</i>
Mountain plover	<i>Charadrius montanus</i>
Mourning dove	<i>Zenaida macroura</i>
Mouse	<i>Peromyscus spp.</i>
Mule deer	<i>Odocoileus hermionus</i>
Muskrat	<i>Ondatra zibethicus</i>
Northern goshawk	<i>Accipiter gentilis</i>
Northern harrier	<i>Circus cyaneus</i>
Northern leopard frog	<i>Rana pipiens</i>
Northern sagebrush lizard	<i>Sceloporus graciosus</i>
Peregrine falcon	<i>Falco peregrinus</i>
Pheasant	<i>Phasianus colchicus</i>
Plains rattlesnake	<i>Crotalus viridis</i>
Plains spadefoot toad	<i>Scaphiopus bombifrons</i>
Prairie dogs	<i>Cynomys spp.</i>
Prairie falcon	<i>Falco mexicanus</i>
Pronghorn	<i>Antilocapra americana</i>
Pygmy rabbit	<i>Brachylagus idahoensis</i>
Raccoon	<i>Procyon lotor</i>
Rail	<i>family Rallidae</i>
Rat	<i>Rattus spp.</i>
Red fox	<i>Vulpes vulpes</i>

<b>Common Name</b>	<b>Scientific Name</b>
Red squirrel	<i>Tamiasciurus hudsonicus</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Ruffed grouse	<i>Bonasa umbellus</i>
Sage sparrow	<i>Amphispiza belli</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Sandhill crane	<i>Grus canadensis</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Short-eared owl	<i>Asio flammeus</i>
Shrew	<i>family Soricidae</i>
Skunk	<i>family Mephitidae</i>
Snipe	<i>Gallinago sp.</i>
Snowshoe hare	<i>Lepus americanus</i>
Spotted bat	<i>Euderma maculatum</i>
Spotted frog	<i>Rana luteiventris</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Swift fox	<i>Vulpes velox</i>
Tiger salamander	<i>Ambystoma tigrinum mavortium</i>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>
Trumpeter swan	<i>Cygnus buccinator</i>
Vole	<i>Microtus sp.</i>
Weasel	<i>Mustela spp.</i>
White-faced ibis	<i>Plegadis chihi</i>
White-tailed deer	<i>Odocoileus virginianus</i>
White-tailed jackrabbit	<i>Lepus townsendii</i>
White-tailed prairie dog	<i>Cynomys leucurus</i>
Yellow-billed cuckoo	<i>Coccyzus americanus</i>
<b>Invertebrates</b>	
Army cutworm	<i>Euxos auxillarius</i>
Fecal coliform bacteria	<i>Escherichia coli</i>
Grasshopper	<i>suborder Caelifera; order Orthoptera</i>
Mormon cricket	<i>Anabrus simplex</i>
Mosquito	<i>Culicidae spp.</i>
Mosquito	<i>Culex tarsalis</i>
Mountain pine beetle	<i>Dendroctonus ponderosae</i>

## Appendix Q. Fire Regime and Vegetation Condition

This appendix provides an overview of fire regime groups and descriptions, fire regime condition classifications, and a general description of the condition of corresponding vegetation types.

**Table Q.1. Fire Regime Groups and Descriptions**

Group	Frequency	Severity	Severity Description
I	0-35 years	Low/mixed	Generally low-severity fires replacing less than 75% of the dominant over story vegetation; can include mixed-severity fires that replace up to 75% of the over story
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant over story vegetation
III	35-200 years	Mixed/low	Generally mixed-severity; can also include low-severity fires
IV	35-200 years	Replacement	High severity fires
V	200+ years	Replacement/any severity	Generally replacement-severity; can include any severity type in this frequency range
Source: DOI and The Nature Conservancy 2008			

**Table Q.2. Fire Regime Condition Classifications**

Condition Class	Severity Description
1	For the most part, fire regimes in this fire condition class are within historical ranges. Vegetation composition and structure are intact. Therefore, the risk of losing key ecosystem components from the occurrence of fire remains relatively low.
2	Fire regimes on these lands have been moderately altered from their historical range by either increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified on these lands.
3	Fire regimes on these lands have been substantially altered from their historical return interval. The risk of losing key ecosystem components from fire is high. Fire frequencies have departed from historical ranges by multiple return intervals. Vegetation composition, structure, and diversity have been substantially altered.
Source: DOI and The Nature Conservancy 2008	

The tables below are an estimate of vegetative conditions based on data from Existing Vegetation, Fire Regimes, and Fire Regime Condition Class (FRCC) from regional LANDFIRE data on biophysical settings (BpS model), as well as estimates from on the ground conditions. The BpS model describes the vegetation, geography, biophysical characteristics, succession stage, disturbance regime, and assumptions. It is designed to accompany the quantitative state and transition models.



**Table Q.3. Forest and Woodland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area**

Vegetation Type	FRCC Description	Fire Regime Group	Landscape Level FRCC	Vegetation Structure and Health
Forest (inclusive of major forest types; lodgepole pine and Douglas fir)	Stand replacement fires dominate FRG IV. The FRCC for the forested communities is displaying indicators of moderate departure from reference conditions and is within the timeline where stand replacement fire would return the communities to a vegetative state dominated by perennial grass and forbs with tree seedlings. Some of these indicators include insect and disease outbreaks and fuel loading associated with a mature forest stand. Some areas of the planning area that point within the timeline may have been altered by changes in the fuel loading by logging and fuels reduction activities, as well as historic fire suppression.	IV	2	<p><b>Lodgepole Pine Structure:</b> Mid-development with Mid–open to Closed canopy 21 to 100 percent moderate to dense pole-sized trees sometimes very dense (dog hair) trees.</p> <p><u>Health:</u> Fire regime of replacement severity – high (35-100 years). Very dense tree stands are more susceptible to disease and insect infestations.</p> <p><b>Douglas Fir Structure:</b> Mid-development closed to open canopy, canopy closure is 10 percent to greater than 35 percent, with small trees to late development with large trees with mixed understory of grass and scattered shrubs. Some stands of Douglas Fir showing old growth characteristics are specific areas.</p> <p><u>Health:</u> Fire Regime of replacement severity – high (35-100 years) high number of trees per acre more susceptible to disease and insect infestations.</p>
Woodlands (inclusive of major woodland types; juniper, aspen and limber pine)	The majority of woodlands fall within FRG IV with isolated woodland stands in rock outcrops falling within FRG V. FRCC 2 is indicative of the woodland communities having moderate departure from reference conditions. Indicators for this FRCC include encroachment of conifers into mature to decadent aspen stands and encroachment of juniper and limber pine out from historic rocky and shallow-soiled sites into shrub habitat.	IV and V	2	<p><b>Juniper Structure:</b> Mid development open class, canopy 21-40 percent, and trees established usually short and widely spaced.</p> <p><u>Health:</u> Fire frequency 35-100+ years. This class last until trees are approximately 100 years old then succeeds to vegetative class with trees greater than 100 years of age.</p> <p><b>Aspen Structure:</b> Mid development closed canopy 41-100 percent; dense, pole six trees in this class. Succession to different class after 50 years. Less forb and shrub cover in understory.</p> <p><u>Health:</u> Succession to different class after 50 years. Less forb and shrub cover in understory in this class.</p> <p><b>Limber Pine Structure:</b> Mid development open canopy 21-40 percent; trees established usually short and widely spaced.</p>

Vegetation Type	FRCC Description	Fire Regime Group	Landscape Level FRCC	Vegetation Structure and Health
				<i>Health:</i> Fire frequency 35-100+ years. This class last until trees are approximately 100 years old then succeeds to vegetative class with trees greater than 100 years of age.
Source: LANDFIRE 2010 FRG Fire Regime Group FRCC Fire Regime Condition Class				

**Table Q.4. Grasslands and Shrubland Fire Regime Groups, Fire Regime Condition Classifications, and Vegetation Structure and Health in the Planning Area**

Vegetation Type	Dominant Fire Regime Group	Estimated Landscape Level FRCC	FRCC Description	Vegetation Structure and Health
Grasslands	I	FRCC 1: 34 percent FRCC 2: 26 percent FRCC 3: 41 percent	Grasslands within the Lander Field Office would historically have experienced fire return interval of 25 years across the landscape. These areas have an altered fuel loading due to a combination of factors including historic and current livestock grazing, human infrastructure and fire suppression. Fire frequency within this vegetative type is far less than would have occurred historically, though the potential loss of key ecosystem components is minimal. Vegetation composition and structure has been significantly altered in FRCC 3 areas.	<p><b>FRCC 1 Structure:</b> Early development class – shrub cover minimal or non-existent, bare ground 10-30 percent, vegetative canopy 0-30 percent (forb cover 10-40 percent, grasses 60-90 percent), maintains vegetation in early development, mixed severity fire (0-37 years) does not change successional age.</p> <p><b>Health:</b> Replacement fire frequency 75 years. Forb density and cover responsive to climatic conditions, in rare flood events (500-year). Moves vegetation to more shrubby condition mid-development, closed after down cutting.</p> <p><b>FRCC 2 Structure:</b> Mid development open to closed class – mostly stable and resilient system with moderate canopy closure, total canopy cover 25-80 percent (grasses greater than 85 percent, forbs 0-5, shrubs 0-10 percent).</p> <p><b>Health:</b> Replacement fire frequency of 75 years, causes transition back to early development class; recurring drought would thin vegetation and keep canopy open.</p> <p><b>FRCC 3 Structure:</b> Late development open to closed class – closed canopy of grasses forbs and shrubs; total cover greater than 85 percent (grasses 25-50 percent, forbs 0-5 percent, shrubs 10-75 percent, 10 percent in transition to shrub or tree dominated communities), mixed fire 35 years moving to mid-development class.</p> <p><b>Health:</b> Replacement fire frequency 75 years. Extended drought would cause transition back to mid-development class with thinning of shrubs; flooding every 100 years would cause transition to early development class.</p>
Sagebrush Shrublands	IV	FRCC 1: 16 percent FRCC 2: 48 percent FRCC 3: 35 percent	Sagebrush shrublands within the Lander Field Office are generally dominated by mature to decadent sagebrush with a secondary component of grass. Depending upon their location within the Lander Field Office,	<p><b>FRCC 1 Structure:</b> Early development Sagebrush cover 0-15 percent (area depending if basin big sagebrush, Wyoming big sagebrush and/or mountain big sagebrush), generally grass dominated with herbaceous cover 30-50 percent, fire frequency 0-35 years.</p> <p><b>Health:</b> Early development class-replacement fire occurs 150-200 years; little to no effect by insect or disease.</p> <p><b>FRCC 2 Structure:</b> Mid-development open sagebrush cover 15-30 percent (area depending if basin big sagebrush, Wyoming big sagebrush and/or</p>

Vegetation Type	Dominant Fire Regime Group	Estimated Landscape Level FRCC	FRCC Description	Vegetation Structure and Health
			these sites would have historically carried fire with variable burnt patch size. A combination of factors including historic and current livestock grazing, human infrastructure and fire suppression have altered the natural disturbance regime within the sagebrush shrublands found in the Lander Field Office. Key ecosystem components are still present, though vegetation composition and structure has been significantly altered in FRCC 3 areas.	<p>mountain big sagebrush), generally becoming shrub dominated, herbaceous cover 10-20 percent, fire frequency same and FRCC 1.</p> <p><i>Health:</i> Same year span on replacement fire however some occurrence of insect or disease impact.</p> <p><b>FRCC 3 Structure:</b> Late development (open and closed). Sagebrush cover greater than 25-80 percent (area depending if basin big sagebrush, Wyoming big sagebrush and/or mountain big sagebrush). Generally shrub dominated with mature and over mature with suppressed understory; herbaceous cover 10 percent; replacement fire occurs every 80-100 years.</p> <p><i>Health:</i> 35-100+ year frequency replacement; replacement fire may cause transition to early development class. Insects and disease occur.</p>
Greasewood and Salt Desert Shrub	IV	Unspecified, needs to be split from Sagebrush Shrublands. Estimated to be dominated by FRCC 1 across landscape.	Fire was very infrequent in this vegetative type. Fire Return Intervals are estimated to be 200 years.	<p><b>Greasewood Structure:</b> Vegetative cover 0-20 percent and/or 21-50 percent; some grasses with greasewood sprouts and rabbitbrush present in early development. In late development open class – greasewood shrubs maturing or have reached maturity and would increase canopy closure; perennial grasses still in understory.</p> <p><i>Health:</i> Wet periods contribute to mortality; susceptible to invasion of nonnative grasses (cheatgrass).</p> <p><b>Salt Desert Shrub Structure:</b> Early development class is only class for the vegetative type – vegetative cover is 0-20 percent; shrubland composed of Gardeners and mat saltbush with some winterfat, scattered forbs, and grasses.</p> <p><i>Health:</i> Wet periods contribute to mortality; susceptible to invasion of nonnative grasses (cheatgrass).</p>

Vegetation Type	Dominant Fire Regime Group	Estimated Landscape Level FRCC	FRCC Description	Vegetation Structure and Health
Mountain Shrub	IV	Unspecified, needs to be split from Sagebrush Shrublands. Estimated to be dominated by FRCC 2 across landscape.	These vegetative communities are dominated by mature to decadent shrub. Though these communities are generally in condition class 2, all of the ecological components are present.	<p><b>Structure:</b> In mid to late development class dominant shrubs are (dependent on primary shrub): sagebrush 15-30 percent; shrub cover with curlleaf mountain mahogany, bitterbrush snowberry and rabbitbrush and mature sagebrush co-dominant, 30-40 percent; grasses and forbs may be present in gaps between shrubs.</p> <p><b>Health:</b> Replacement fire frequency is 80-150 years. Insect and disease may occur; weather related mortality every 200 years would transition to early development.</p>
<p>Source: LANDFIRE 2010</p> <p>Vegetative structure in each vegetative class incorporates biophysical setting models for Map Zone 22; Inter-Mountain Basins Curl-leaf Mountain Mahogany woodland, Inter-mountain Basins Mat Saltbush shrubland, Wyoming Basins Dwarf Sagebrush shrubland and steppe, Inter-Mountains Basins Big Sagebrush shrubland-Basin Big Sagebrush, Inter-Mountain Basins Big Sagebrush shrubland-Wyoming Big Sagebrush, Inter-Mountain Basin Montane Sagebrush steppe, Inter-Mountain Basins Semi-Desert Shrub Steppe, Inter-Mountains Basins Semi-desert Grassland, Northern Rock Mountain Lower Montane-Foothill-valley grassland, and Inter-Mountains Basins Greasewood Flat.</p> <p>FRG Fire Regime Group FRCC Fire Regime Condition Class</p>				

## **Appendix R. Lands Proposed by the Public for Land Tenure Adjustment(s)**

The following lands have been identified by the public for land tenure adjustment. These lands are not on the list of lands being carried forward from the existing plan as lands that the Bureau of Land Management (BLM) has identified for land tenure adjustment under any alternative. The BLM's land tenure program is designed to: (1) improve management of natural resources through consolidation of federal, state, and private lands; (2) increase recreational opportunities and preserve open space; (3) secure key property necessary to protect endangered species and promote biological diversity; (4) preserve archeological and historical resources; (5) implement specific acquisitions authorized by Acts of Congress; and (6) allow for expansion of communities and consolidation of non-federal land ownership. These properties are depicted on Map 141. Legal property descriptors of lands identified for land tenure adjustment are as follows:

### **T. 29 N., R. 101 W.,**

Sec. 13: W2SW, SWSE;

### **T. 29 N., R. 96 W.,**

Sec. 7: SWNW, NWSW;

### **T. 29 N., R. 97 W.,**

Sec. 1: SWSW;

2: SE;

3: N2N2, SWNE, SWNW;

4: N2, SWSW, N2SE;

5: N2NE, W2SW, SESW, SWSE;

6: W2NW, S2;

7: SENE, N2NW, SWNW, SE;

8: All;

9: N2, N2S2, SWSW;

10: N2;

11: N2, NESE;

12: All;

17: NE, W2, NWSE;

18: All;

### **T. 29 N., R. 98 W.,**

Sec. 12: E2NE, NESE;

13: All;

14: SENE, E2SE;

**T. 30 N., R. 97 W.,**

Sec. 21: E2SE;

22: SW, W2SE, SESE;

26: SWNW, W2SW;

27: All Except SWSW;

28: N2NE, SENE, SWNW, W2SW, SESW, SWSE;

29: S2N2, NWNW, S2;

30: NENE, SW, S2SE;

31: All;

32: All;

33: NWNE, S2NE, NW, S2;

34: All Except NWNW;

35: W2W2, SENW, E2SW, W2SE.

**T. 33 N., R. 98 W.,**

Sec. 17: W2SW;

18: E2E2, SWSE;

19: All Except NWNW;

20: W2;

**T. 33 N., R. 99 W.,**

Sec. 24: SENE;

**T. 33 N., R. 100 W.,**

Sec. 5: NWNE, NW, N2SW;

**T. 34 N., R. 100 W.,**

Sec. 32: SWNW, W2SW, SESW, SWSE

The lands identified in T. 29 N., R. 101 W., are in proximity to Big Atlantic Gulch and Little Atlantic Gulch. There are springs and water developments in the area and the lands are part of the Atlantic City Common grazing allotment and are located northeast of Atlantic City, Wyoming.

Recreation is the major factor in the area — hence, the Big Atlantic Gulch campground. The campground is used in the summer by tourists and campers in the area as well as in the fall, particularly during hunting season. The area also has use in the wintertime by winter sports enthusiasts (i.e., snowmobiling, cross-country skiing, snowshoeing, etc.) The area is known for its historic mining. These lands are located within the South Pass Historic Mining Area Area of Critical Environmental Concern (ACEC).

The lands located in T. 29 N., R. 96, 97, 98 W., and T. 30 N., R. 97 W., are in proximity to numerous cultural, historic, and recreational values east/northeast of Atlantic City, Wyoming. The lands are located within the Silver Creek grazing allotment. Portions of these lands are located within the National Historic Trails (NHTs) ACEC. Schoettlin Mountain was nominated as an ACEC, but was not carried forward. There are a number of historical mining operations within the area as well as the NHTs. Beaver Creek is located within a portion of the private and state lands as well as Strawberry Creek. Strawberry Creek joins in the Sweetwater River which is adjacent to the lands identified.

The lands located in T. 33 N., R. 98 and 99 W. are in a portion of BLM blocked up lands with public access from Johnny Behind the Rocks from the south and from the Coal Mine Road to the north. These lands are located southwest of Hudson, Wyoming and are part of a common grazing allotment. The lands are used for recreation as well as grazing. The lands are located within greater sage-grouse Core Area and comprise deer and pronghorn habitat.

The lands located in T. 33 and 34 N., R. 100 W. are located west of Lander, Wyoming with Red Butte to the south and the North Fork Road to the north. These lands have been identified for the purpose of protecting wildlife and open space resources of the adjoining private property owner.

Further, land tenure adjustments (purchase, donation, exchange, and sales) are to be in the public's interest and to the public's benefit.



# Appendix S. Lands Identified for Disposal

**Table S.1. Lands Identified for Disposal**

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
1	T. 43 N., R. 108 <u>W.</u> Sec. 27: SW $\frac{1}{4}$ NW $\frac{1}{4}$ , NW $\frac{1}{4}$ SW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-MG-3 CR-C-0-0 R-HV	X	X
5	T. 42 N., R. 108 <u>W.</u> Sec. 21: S $\frac{1}{2}$ NE $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-E-3 WL-D-3 WL-MG-3 CR-A-0-0 F-C	X	X
7	T. 43 N., R. 108 <u>W.</u> Sec. 35: NE $\frac{1}{4}$ SW $\frac{1}{4}$  40 acres	None  (December 10, 2008)	Coal withdrawal  (No effect)	WL-M-3 WL-R-4 WL-MG-3 CR-B-0-0	X	X
8	T. 42 N., R. 108 <u>W.</u> Sec. 2: E2SE $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-D-3 WL-M-3 WL-RP-4 CR-B/C-0-0	X	X
11	T. 42 N., R. 107 <u>W.</u> Sec. 18: S $\frac{1}{2}$ NW $\frac{1}{4}$ , SW $\frac{1}{4}$  240 acres	None  (December 10, 2008)	None	WL-D-3 WL-SG-3 CR-B-0-0	X	X
12	T. 42 N., R. 108 <u>W.</u> Sec. 25: N $\frac{1}{2}$ NE $\frac{1}{4}$  80 acres	None  (December 10, 2008)	Yes, power site withdrawal  Res. 6  EO 07-02-1910	WL-D-3 WL-M-3 WL-WF-3 WL-F-3 WL-T&E-3&4 WL-RP-3 CR-B-12.5-O R-HV	X	
14	T. 42 N., R. 107 <u>W.</u> Sec. 17: S $\frac{1}{2}$ SW $\frac{1}{4}$  20: NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$  280 acres	None  (December 10, 2008)	None	WL-D-3 WL-SG-3 A-A/B-0-0	X	X

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
24	T. 43 N., R. 105 W., Sec. 32: W $\frac{1}{2}$ NW $\frac{1}{4}$ 80 acres	None (May 8, 1984)	PLO 6960	WL-E-1 WL-D-3 WL-MG-3 CR-A/B-0-0 R-HV East Fork Elk Winter Range	X	X
25	T. 43 N., R. 105 W., Sec. 33: E $\frac{1}{2}$ E $\frac{1}{2}$ , W $\frac{1}{2}$ NE $\frac{1}{4}$ 34: W $\frac{1}{2}$ W $\frac{1}{2}$ 400 acres	None (December 10, 2008)	PLO 6960	WL-E-3 WL-D-3 WL-MG-3 CR-A/B-0-0 R-HV East Fork Elk Winter Range	X	X
26	T. 42 N., R. 105 W., Sec. 4: Lots 3, 4 (N $\frac{1}{2}$ NW $\frac{1}{4}$ ) S $\frac{1}{2}$ NW $\frac{1}{4}$ Sec. 5: SE $\frac{1}{4}$ NE $\frac{1}{4}$ 200.7 acres	None (December 10, 2008)	PLO 6960	WL-E-1 WL-D-3 CR-A/B-0-0 R-HV East Fork Elk Winter Range	X	X
27	T. 42 N., R. 105 W., Sec. 3: S $\frac{1}{2}$ SE $\frac{1}{4}$ 10: NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ 280 acres	None (December 10, 2008)	PLO 6960	WL-D-1 WL-E-1 CR-B-0-0 R-HV East Fork Elk Winter Range	X	X
28	T. 42 N., R. 105 W., Sec. 9: SW $\frac{1}{4}$ SE $\frac{1}{4}$ 40 acres	None (December 15, 2008)	None	WL-D-1 WL-E-1 WL-M-3 CR-B-0-0 R-HV	X	X <sup>1</sup>
34	T. 41 N., R. 105 W., Sec. 8: NW $\frac{1}{4}$ NW $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$ 80 acres	None (December 10, 2008)	None	WL-D-1 WL-A-3 WL-BS-1 CR-BC-0-0	X	X <sup>1</sup>

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
38	T. 40 N., R. 106 W., Sec. 22: SE¼NE¼, S½ 360 acres	None  (December 10, 2008)	None	WL-E-3 WL-D-3 WL-BS-1 WL-M-3 CR-B/C-0-0 R-HV	X	X <sup>1</sup>
48	T. 33 N., R. 100 W., Sec. 28: E½SE¼ 80 acres	None  (December 10, 2008)	None	WL-D-1 WL-M-3 WL-UP-3 CR-C-0-0 (MLs-P-M)	X	X
56	T. 32 N., R. 99 W., Sec. 17: SE¼NW¼ 40 acres	None  (December 15, 2008)	None	WL-D-3 CR-C-0-0	X	X
62	T. 32 N., R. 99 W., Sec. 30: SE¼NE¼ 40 acres	None  (December 10, 2008)	None	WL-D-1 WL-M-3 CR-C-0-0	X	X
66	T. 31 N., R. 98 W., Sec. 5: Lot 4, SE¼NW¼ 80.86 acres	None  (December 10, 2008)	None	WL-SG-2 WL-D-1 CR-C-0-0 (MLs-P-M)	X	X
67	T. 31 N., R. 98 W., Sec. 21: SE¼NE¼ 40 acres	None  (December 10, 2008)	None	WL-D-1 CR-C-0-0	X	
68	T. 30 N., R. 98 W., Sec. 7: NE¼SE¼  18: SE¼NE¼, NE¼NW¼ 120 acres	None  (December 10, 2008)	EO 9/4/1912  Wdl Pho Res 15	WL-M-1 WL-F-3 CR-B/C-0-0 (MLs-P-M)	X	

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
69	T. 30 N., R. 98 W., Sec. 12: S½NE¼, SE¼NW¼  N½N½  280 acres	None  (December 15, 2008)	None	WL-SG02 WL-D-3 WL-M-1 WL-UG-3 CR-B/C-0-0	X	
70	T. 30 N., R. 97 W., Sec. 18: SE¼SE¼  19: NE¼NE¼  20: NW¼NW¼  120 acres	None  (December 15, 2008)	None	WL-SG-2 CR-B/C-0-0	X	
71	T. 29 N., R. 100 W., Sec. 25: NE¼  160 acres	None  (December 15, 2008)	None	WL-M-1 CR-B/C-0-0	X	
72	T. 29 N., R. 98 W., Sec. 7: Lot 5  37.57 acres	None  (December 10, 2008)	None	WL-M-1 CR-B/C-0-0 MLc-Au-H	X	X
73	T. 29 N., R. 98 W., Sec. 10: SE¼SW¼, SW¼SE¼  15: NE¼NE¼  120 acres	None  (December 10, 2008)	None	WL-M-3 CR-B/C-0-0	X	X
74	T. 29 N., R. 98 W., Sec. 11: SW¼NE¼, S½NW¼  120 acres	None  (December 10, 2008)	None	WL-M-3 CR-C-0-0 (MLs-P-M)	X	X

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
75	T. 29 N., R. 98 W., Sec. 1: SW $\frac{1}{4}$ SW $\frac{1}{4}$  12: W $\frac{1}{2}$ NW $\frac{1}{4}$ , NW $\frac{1}{4}$ SW $\frac{1}{4}$  160 acres	None  (December 10, 2008)	None	WL-M-3 CR-B/C-0-0 (MLs-P-M)	X	X
78	T. 31 N., R. 97 W., Sec. 10: SW $\frac{1}{4}$ SE $\frac{1}{4}$  11: N $\frac{1}{2}$ SW $\frac{1}{4}$  120 acres	None  (December 10, 2008)	None	WL-D-3 WL-A-1 CR-B/C-0-0	X	X
79	T. 31 N., R. 97 W., Sec. 12: SE $\frac{1}{4}$ SE $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-D-1 WL-A-1 CR-B/C-0-0	X	X
80	T. 31 N., R. 96 W., Sec. 18: SW $\frac{1}{4}$ SE $\frac{1}{4}$  19: N $\frac{1}{2}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$  160 acres	None  (December 10, 2008)	None	WL-D-1 WL-A-1 CR-B/C-0-0 MS-SG-H	X	X
81	T. 31 N., R. 96 W., Sec. 20: SE $\frac{1}{4}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$  29: NE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ NE $\frac{1}{4}$  28: W $\frac{1}{2}$ NW $\frac{1}{4}$  320 acres	None  (December 10, 2008)	None	WL-R-2 WL-D-1 WL-A-1* CR-B/C-0-0 *Also restricted area no. 2	X	X
82	T. 31 N., R. 96 W., Sec. 21: SE $\frac{1}{4}$ SE $\frac{1}{4}$  22: SW $\frac{1}{4}$ SW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-D-3 WL-A-1 CR-C-0-0	X	X

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
83	T. 31 N., R. 96 W., Sec. 27: SW $\frac{1}{4}$ SW $\frac{1}{4}$  34: NW $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$  120 acres	None  (December 15, 2008)	None	WL-D-1 WL-A-1 CR-C-0-0	X	X
84	T. 31 N., R. 96 W., Sec. 33: E $\frac{1}{2}$ SE $\frac{1}{4}$  80 acres	None  (December 15, 2008)	None	WL-D-1 WL-A-3 CR-C-0-0	X	X
85	T. 31 N., R. 96 W., Sec. 35: N $\frac{1}{2}$ SW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-D-1 WL-E-3 WL-RP-3 CR-B-C-0-0	X	
86	T. 40 N., R. 94 W., Sec. 11: NE $\frac{1}{4}$ NW $\frac{1}{4}$  40 acres	None  (December 15, 2008)	None	WL-D-1 WL-UG-3	X	X
87	T. 40 N., R. 94 W., Sec. 12: SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$  T. 39 N., R. 93 W., Sec. 7: SW $\frac{1}{4}$ NW $\frac{1}{4}$  120 acres	None  (December 16, 2008)	None	WL-D-1 WL-UG-3 CR-C-0-0 MLs-Au-H	X	X
88	T. 40 N., R. 93 W., Sec. 5: SE $\frac{1}{4}$ NE $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-UG-3 CR-B/C-0-0	X	X
89	T. 40 N., R. 93 W., Sec. 3: SW $\frac{1}{4}$ SW $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-UG-3 CR-C-0-0	X	X

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
90	T. 40 N., R. 92 W., Sec. 6: Lot 5  T. 40 N., R. 93 W., Sec. 1: NW $\frac{1}{4}$ SE $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$  128.15 acres	None  (December 10, 2008)	None	WL-E-2 CR-C-0-0	X	X
91	T. 40 N., R. 93 W., Sec. 14: SW $\frac{1}{4}$ NW $\frac{1}{4}$  15: NE $\frac{1}{4}$ SE $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-D-3 CR-C-0-0	X	X
92	T. 40 N., R. 91 W., Sec. 19: NW $\frac{1}{4}$ SE $\frac{1}{4}$  20: NW $\frac{1}{4}$ SW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-D-1 WL-UG-3 CR-B/C-0-0	X	X
93	T. 40 N., R. 92 W., Sec. 11: S $\frac{1}{2}$ SE $\frac{1}{4}$  80 acres	None  (December 16, 2008)	None	WL-D-1 WL-E-3 WL-UG-3 CR-B-0-0 MLC-U-H	X	X
96	T. 40 N., R. 91 W., Sec. 5: NE $\frac{1}{4}$ NW $\frac{1}{4}$ (Lot 3)  45.83 acres	None  (December 10, 2008)	None	WL-RP-4 CR-A/B-0-0	X	
97	T. 40 N., R. 91 W., Sec. 8: N $\frac{1}{2}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$  120 acres	None  (December 10, 2008)	None	CR-B-0-0	X	

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
98	T. 40 N., R. 91 W., Sec. 9: NE $\frac{1}{4}$ NW $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	CR-B-0-0	X	
99	T. 40 N., R. 91 W., Sec. 10: SW $\frac{1}{4}$ NW $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-D-1 WL-RP-3 CR-A/B-0-0	X	X
101	T. 40 N., R. 91 W., Sec. 3: Lots 1, 2  91.88 acres	None  (December 10, 2008)	None	WL-D-1 WL-UG-3 WL-RP-4 CR-B/C-0-0	X	X
105	T. 40 N., R. 89 W., Sec. 9: N $\frac{1}{2}$ NE $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-SG-2 WL-E03 CR-C-0-0	X	X
106	T. 39 N., R. 91 W., Sec. 24: NW $\frac{1}{4}$ SE $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-D-1 WL-A-1 CR-B/C-0-0 MLs-OG-H	X	X
108	T. 39 N., R. 89 W., Sec. 8: E $\frac{1}{2}$ NW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-D-3 WL-A-1 CR-B/C-0-0 MLs-OG-H	X	X
109	T. 39 N., R. 89 W., Sec. 8: NE $\frac{1}{4}$ SE $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-D-1 WL-A-1 WL-RP-4 CR-B/C-100-4 MLs-OG-H MS-SG-H (FUP)	X	X
110	T. 39 N., R. 89 W., Sec. 8: SW $\frac{1}{4}$ SW $\frac{1}{4}$  17: NW $\frac{1}{4}$ NW $\frac{1}{4}$  18: NE $\frac{1}{4}$ NE $\frac{1}{4}$  120 acres	None  (December 10, 2008)	None	WL-D-3 WL-A-1 WL-RP-4 CR-B/C-0-0 MLs-OG-H MS-SG-H (FUP)	X	X



Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
112	T. 38 N., R. 94 W., Sec. 11: SW $\frac{1}{4}$ SW $\frac{1}{4}$  14: W $\frac{1}{2}$ NW $\frac{1}{4}$  120 acres	None  (December 10, 2008)	Yes, Cl.  SO 08/25/1945  CL Pwr S 375  NW $\frac{1}{4}$ NW $\frac{1}{4}$ of Sec. 14 only	WL-R-2 WL-D-3 WL-A-1 CR-B/C-0-0	X	X
118	T. 37 N., R. 89 W., Sec. 28: NW $\frac{1}{4}$ NW $\frac{1}{4}$  29: N $\frac{1}{2}$ N $\frac{1}{2}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ ,  S $\frac{1}{2}$ NW $\frac{1}{4}$  320 acres	None  (December 10, 2008)	None	WL-D-3 WL-A-1 WL-RP-3 CR-B-0-0	X	X
119	T. 35 N., R. 92 W., Sec. 4: Lot 1  41.31 acres	None  (March 13, 1984)	None	WL-D-3 WL-A-1 WL-RP-3 CR-B-0-0	X	X
121	T. 35 N., R. 90 W., Sec. 10: SE $\frac{1}{4}$ SW $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-SG-2 WL-D-3 CR-C-100-0	X	X
122	T. 34 N., R. 94 W., Sec. 31: NE $\frac{1}{4}$ NE $\frac{1}{4}$  32: NW $\frac{1}{4}$ NW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	CR-C-0-0	X	X
124	T. 31 N., R. 92 W., Sec. 33: S $\frac{1}{2}$ NW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	CR-B-0-0	X	X

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
127	T. 30 N., R. 93 <u>W.</u> Sec. 26: SW $\frac{1}{4}$ SW $\frac{1}{4}$  34: NE $\frac{1}{4}$ NE $\frac{1}{4}$  35: NW $\frac{1}{4}$ NW $\frac{1}{4}$  120 acres	None  (December 10, 2008)	None	WL-D-3 WL-A-1 CR-A/B-0-3	X	
133	T. 29 N., R. 92 <u>W.</u> Sec. 23: NE $\frac{1}{4}$ SE $\frac{1}{4}$  24: NW $\frac{1}{4}$ SW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-SG-2 WL-A-1 CR-B-0-0	X	X
136	T. 30 N., R. 89 <u>W.</u> Sec. 29: SW $\frac{1}{4}$ SW $\frac{1}{4}$  32: NW $\frac{1}{4}$ NW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-D-3 WL-RS03 WL-R04 CR-B/C-0-0	X	X
137	T. 30 N., R. 89 <u>W.</u> Sec. 15: S $\frac{1}{2}$ NW $\frac{1}{4}$ , SW $\frac{1}{4}$  240 acres	None  (December 10, 2008)	None	WL-D-1 WL-D03 WL-R-4 CR-B/C-0-0	X	X
138	T. 30 N., R. 89 <u>W.</u> Sec. 9: SE $\frac{1}{4}$  10: NW $\frac{1}{4}$ SW $\frac{1}{4}$  200 acres	None  (December 10, 2008)	None	WL-D-1 WL-D-3 WL-R-4 WL-A+4-4 CR-B-0-4	X	X
139	T. 32 N., R. 88 <u>W.</u> Sec. 3: NW $\frac{1}{4}$ SW $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	CR-B/C-0-0	X	X

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
140	T. 32 N., R. 88 W., Sec. 15: W $\frac{1}{2}$ SE $\frac{1}{4}$  22: NW $\frac{1}{4}$ NE $\frac{1}{4}$  120 acres	None  (December 10, 2008)	None	CR-B/C-0-0	X	X
141	T. 32 N., R. 87 W., Sec. 3: Lot 4  41.58 acres	None  (December 10, 2008)	None	WL-D-3 WL-E CR-B/C-0-0	X	X
143	T. 32 N., R. 87 W., Sec. 15: NW $\frac{1}{4}$ NE $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-E CR-C-0-0	X	X
144	T. 32 N., R. 87 W., Sec. 31: NW $\frac{1}{4}$ SE $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	CR-B/C-0-0	X	X
145	T. 31 N., R. 87 W., Sec. 5: SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	CR-B/O-0-0	X	X
146	T. 31 N., R. 87 W., Sec. 28: W $\frac{1}{2}$ NE $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	CR-B/C-0-0	X	X
147	T. 32 N., R. 85 W., Sec. 13: NE $\frac{1}{4}$ NE $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-D-3 WL-A-3 CR-B/C-0-0	X	X

Parcel No.	Legal Description	Mining Claims	Withdrawals	Resource Values	Alternative A	Alternatives B, C, and D
149	T. 30 N., R. 85 W., Sec. 7: SE $\frac{1}{4}$ SW $\frac{1}{4}$  18: E $\frac{1}{2}$ NW $\frac{1}{4}$  120 acres	None  (December 10, 2008)	None	CR-B/C-0-0	X	
150	T. 30 N., R. 85 W., Sec. 29: NW $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$  80 acres	None  (December 10, 2008)	None	WL-A-1 WL-WF-3 CR-B-0-0	X	
158	T. 29 N., R. 88 W., Sec. 20: NE $\frac{1}{4}$ NW $\frac{1}{4}$ ,  E2NW $\frac{1}{4}$ NW $\frac{1}{4}$ ,  NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$  19: N $\frac{1}{2}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ ,  SW $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$  100 acres	None  (December 10, 2008)	None	WL-A-1 WL-WF-4 CR-A-0-3,4	X	
160	T. 28 N., R. 89 W., Sec. 24: SW $\frac{1}{4}$ NW $\frac{1}{4}$  40 acres	None  (December 10, 2008)	None	WL-A-1 CR-B/C-0-0 MS-SG-H	X	X
167	T. 33 N., R. 93 W., Sec. 33: E $\frac{1}{2}$ E $\frac{1}{2}$  34: W $\frac{1}{2}$ NW $\frac{1}{4}$  240 acres	None  (December 10, 2008)	None	CR-C/B-0-0	X	X
<sup>1</sup> Dispose subject to restrictions on use.						

**Table S.2. Resource Value Legend – Wildlife**

<b>Wildlife (includes Fisheries)</b>			
Resource	Species	Habitat Component	Example
WL = Wildlife	A = Antelope D = Deer BS = Bighorn Sheep M = Moose SG = Sage-grouse MG = Mountain grouse WF = Waterfowl – shorebird UG = Other Upland Game F = Fisheries TE = Threatened, Endangered, or State Sensitive R = Raptor RP = Riparian PF = Predator-Furbearer	1. <u>Crucial</u> (seasonal) habitat- i.e., crucial winter range, beaver ponds.  2. <u>Breeding, Nesting, Parturition areas</u> i.e., greater sage-grouse leks and nesting areas, raptor nest sites, elk calving areas, spawning beds, etc.  3. <u>Important Habitat Components</u> i.e., winter, winter/year-long range, live streams, riparian habitat, wet meadows, or scarce forage, cover, substrate types or ecosystems limiting species. Serves winter relief range.  4. <u>Important Habitat Feature</u> i.e. water development, springs, habitat improvement projects, cliffs, snag trees, etc.  5. <u>Long-Term Permanent Studies</u> i.e., condition and trend, riparian, monitoring, exclosures, etc.	WL-E-1: Wildlife Elk Crucial Winter Range  WL-F-3: Wildlife (Fisheries) Trout Stream  WL-SG-2: Wildlife Sage-Grouse Lek

**Table S.3. Resource Value Legend – Cultural Resources**

<b>Cultural Resources</b>				
Resource	Site Potential	Percent of Study Parcel Inventoried	Known Sites with Present National Register Status	Example
CR = Cultural Resources	A = High B = Medium C = Low	0-100%	0 = No Known Sites 1 = Nation Register Enrolled 2 = Nation Register Nominated 3 = Nation Register Eligible 4 = Unknown 5 = Not Eligible	CR-A/B-.50-4 = Cultural Resource, High to Medium Potential, 50 percent inventoried with a National Register Status

**Table S.4. Resource Value Legend – Recreation**

<b>Recreation</b>	
Resource	Level of Use or Potential
R= Recreation	HV = High Value

**Table S.5. Resource Value Legend – Forestry**

<b>Forestry</b>	
<b>Resource</b>	<b>Level of Use or Potential</b>
F = Forestry	C = Commercial

**Table S.6. Resource Value Legend – Minerals**

<b>Minerals</b>			
<b>Mineral Class</b>	<b>Commodity</b>	<b>Rating Value</b>	<b>Example</b>
MLs = Leaseables	OG = Oil and Gas C = Coal G = Geothermal S = Sodium P = Phosphate	H = High M = Moderate L = Low U = Unknown	MLs-OG-H = High Potential value for occurrence of oil and gas
MLc = Locatables	AU = Gold Ag = Silver Cu = Copper W = Tungsten Pb = Lead K = Feldspar (Fluorspar) Fe = Iron U = Uranium T = Thorium J = Jade B = Bentonite Z = Zeolites	H = High M = Moderate L = Low U = Unknown	
MS = Salables	SG = Sand and Gravel St = Stone (Building) Ls = Limestone P = Pumice, Pumicite Ss = Sandstone Sh = Shale (Clay)	H = High M = Moderate L = Low U = Unknown	

## **Appendix T. Surface Disturbance and Reasonable Foreseeable Actions**

This appendix includes information on surface disturbance and reasonable foreseeable actions within the planning area. Table T.1, “Summary of Projected Acres of Surface Disturbance by Resource” (p. 1536) provides projected acres of surface disturbance by resource. Table T.2, “Oil and Gas Reasonable Foreseeable Development Assumptions” (p. 1543) provides foreseeable development assumptions for oil and gas; the projected surface disturbances for oil and gas in Table T.1, “Summary of Projected Acres of Surface Disturbance by Resource” (p. 1536) are based on the project assumptions in Table T.2, “Oil and Gas Reasonable Foreseeable Development Assumptions” (p. 1543). Assumptions for all other resources are provided in each resource section in Table T.1, “Summary of Projected Acres of Surface Disturbance by Resource” (p. 1536).

Table T.1. Summary of Projected Acres of Surface Disturbance by Resource

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
<b>Mineral Resources – Leasable Oil and Gas (includes CBNG)</b>				
Acres Short-Term Disturbance from BLM Actions	15,405	10,720	15,473	14,473
Acres Reclaimed from BLM Actions	7,410	5,242	7,441	6,978
Acres Long-Term Disturbance from BLM Actions	7,995	5,478	8,032	7,495
Acres Short-Term Disturbance from Non-BLM Actions	7,070	7,060	7,070	7,060
Acres Reclaimed from Non-BLM Actions	3,359	3,354	3,359	3,354
Acres Long-Term Disturbance from Non-BLM Actions	3,711	3,706	3,711	3,706
<b>Mineral Resources - Locatable</b>				
Acres Short-Term Disturbance from BLM Actions	2,169.2	2,169.2	2,169.2	2,169.2
Assumptions	<p>Assumes that historical use will continue for the 20 years of the plan.</p> <p>Notice level activities: assumes 13.46 acres of surface disturbance per year over the 20 years of the plan, based upon 282 acres total over the period 1989-2009.</p> <p>Plan of Operations level activities: Assumes 95 acres of surface disturbance per year based on 1995.3 total acres over the last 21 years.</p>			
Acres Reclaimed from BLM Actions	269.2	269.2	269.2	269.2
Assumptions	Assumes that the 13.46 acres per year of short-term disturbance from actions under a Notice are reclaimed within two years.			
Acres Long-Term Disturbance from BLM Actions	1,900	1,900	1,900	1,900
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Assumptions	BLM manages almost all locatable minerals (see Chapter 3) and it is speculative as to how much development will occur.			
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<b>Mineral Resources – Mineral Material Disposals</b>				
Acres Short-Term Disturbance from BLM Actions	3,660	3,660	3,660	3,660
Acres Reclaimed from BLM Actions	3,660	3,660	3,660	3,660
Assumptions	Assumes that historical averages of 183 acres per year will continue at past rate, which reflects the use of mineral materials for extensive AML reclamation. Assumes that area will be reclaimed upon completion of the removal of the material.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Assumptions	Assumes demand for mineral material is flat. Therefore, either there will be no mineral materials disposals on state and private land or if there are, the federal disturbance would be reduced by an equal amount.			
Acres Short-Term Disturbance from Non-BLM Actions	0	0	0	0
Acres Reclaimed from Non-BLM Actions	0	0	0	0
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0



Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Fire and Fuels Management <sup>1</sup>				
Prescribed Fire				
Acres Short-Term Disturbance from BLM Actions	6,000	20,000	6,000	10,000
Assumptions	Assumes 300 acres per year for 20 years.	Assumes 1000 acres per year for 20 years.	Assumes 300 acres per year for 20 years.	Assumes 500 acres per year for 20 years.
Acres Reclaimed from BLM Actions	6,000	20,000	6,000	10,000
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Assumptions	BLM considers this too speculative to quantify.			
Mechanical Fuels Treatment				
Acres Short-Term Disturbance from BLM Actions	10,000	30,000	10,000	10,000
Assumptions	Assumes 500 acres per year.	Assumes 1,500 acres per year.	Assumes 500 acres per year.	Assumes 500 acres per year.
Acres Reclaimed from BLM Actions	10,000	30,000	10,000	10,000
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions <sup>2</sup>	8,500	8,500	8,500	8,500
Assumptions	Assumes 425 acres per year.	Assumes 425 acres per year.	Assumes 425 acres per year.	Assumes 425 acres per year.
Acres Reclaimed from Non-BLM Actions	8,500	8,500	8,500	8,500
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Assumptions	The number of acres of treatment may be low as it includes estimates from USFS which may increase in the future as pine beetle damaged areas are treated. In addition, WGFD and private parties conduct treatments which has short term disturbance but limited long term disturbance.			
Forest, Woodlands, and Forest Products				
Acres Short-Term Disturbance from BLM Actions	375	550	550	600
Assumptions	Assumes historic patterns will continue.	Assumes small increase because of beetle kill.	Assumes small increase because of beetle kill.	Assumes small increase because of beetle kill plus more cutting for safety.
Acres Reclaimed from BLM Actions	375	550	550	600
Assumptions	Assumes all acres will be reclaimed.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Assumptions	BLM considers this too speculative to quantify. Substantial potential exists for forest product removal from the Shoshone National Forest. In Fiscal Year 2010, the Shoshone National Forest had American Recovery and Reinvestment Act related stimulus funds and treated approximately 5,000 acres. Generally, this number is very low.			
Invasive Species				
Acres Short-Term Disturbance from BLM Actions	0	0	0	0
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	10,000	10,000	10,000	10,000
Assumptions	Assumes 500 acres per year.	Assumes 500 acres per year.	Assumes 500 acres per year.	Assumes 500 acres per year.
Acres Reclaimed from Non-BLM Actions	10,000	10,000	10,000	10,000
Acres Long-Term Disturbance from Non-BLM Actions	0	0	0	0
Assumptions	Assumes consistent treatment by WGFD on non-BLM surface, treatment by Firewise, and private services. Assumes brush-type treatments which are fully reclaimed.			
Renewable Energy - Wind-Energy Development				
Acres Short-Term Disturbance from BLM Actions	2,250	0	108,000	2,250
Assumptions	1 project with 50 turbines over 20 years	No projects	2,400 turbines, averaged to 5,400 acres per year	1 project with 50 turbines over 20 years
Acres Reclaimed from BLM Actions	1,250	0	60,000	1,250
Assumptions	Assumes that 25 acres/turbine will be reclaimed within 2 years and that 20 acres/turbine will be long-term surface disturbance.			
Acres Long-Term Disturbance from BLM Actions	1,000	0	48,000	1,000
Rights-of-Way (ROW)				
Telephone and Fiber Optics				
Acres Short-Term Disturbance from BLM Actions	269	54	277	144
Assumptions	13.43 per year (historic trend)	2.68 per year (historic trend reduced by percent based on areas closed to ROW)	13.83 per year (historic trend increased by percentage reduced areas closed to ROW)	7.22 per year (historic trend reduced by percentage areas closed to ROW)
Acres Reclaimed from BLM Actions	269	54	277	144
Assumptions	Assumes that any disturbance is reclaimed within 2 years.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Pipelines (oil and gas)				

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Short-Term Disturbance from BLM Actions	8,950	7,017	9,208	8,555
Assumptions	Assumes historic average will continue.	Assumes historic average reduced by percent fewer wells.	Assumes historic average increased by percent more wells.	Assumes historic average reduced by percent fewer wells.
Acres Reclaimed from BLM Actions	8,950	7,017	9,208	8,555
Assumptions	Assumes pipelines will be reclaimed within 2 years.			
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Roads<sup>2</sup></i>				
Acres Short-Term Disturbance from BLM Actions	231.80	36.36	237.93	115.5
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	231.80	36.36	237.93	115.5
Assumptions	Assumes historic average will continue.	Assumes historic average reduced by percent closed to ROW.	Assumes historic average increased by percent open to ROW.	Assumes historic average reduced by percent closed to ROW.
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Powerlines (power and telephone)</i>				
Acres Short-Term Disturbance from BLM Actions	1,969.2	393.84	2,028	984.6
Assumptions	Assumes historic average will continue.	Assumes historic average reduced by percent closed to ROW.	Assumes historic average increased by percent open to ROW.	Assumes historic average reduced by percent closed to ROW.
Acres Reclaimed from BLM Actions	1,969.2	393.84	2,028	984.6
Acres Long-Term Disturbance from BLM Actions	0	0	0	0
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Communication Sites</i>				
Acres Short-Term Disturbance from BLM Actions	412.8	15	425.18	57.84

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Assumptions	Assumes historic average of 20.64 acres per year will continue.	Assumes minor expansion of designated sites will be disturbed at a rate lower than historical average.	Assumes historic average increased by percent open to ROW.	Assumes minor expansion of designated sites will be disturbed at a rate lower than historical average.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	412.8	57.84	425.18	57.84
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Other Facilities<sup>3</sup></i>				
Acres Short-Term Disturbance from BLM Actions	39	30.6	40	37.32
Assumptions	Assumes historic average of 1.95 acres per year will continue.	Assumes 1.53 acres (historic average reduced by percent fewer wells).	Assumes 2 acres per year acres (historic average increased by percent more wells).	Assumes 1.87 acres (historic average reduced by percent fewer wells).
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	39	30.60	40	37.32
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<b>Livestock Grazing</b>				
<i>Spring Development</i>				
Acres Short-Term Disturbance from BLM Actions	82.4	0	88.4	45.76
Assumptions	Assumes 4.12 acres per year.	Assumes 0 acres per year.	Assumes 4.42 acres per year.	Assumes 2.29 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	82.4	0	88.4	45.76
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Reservoir/Pit Development</i>				
Acres Short-Term Disturbance from BLM Actions	220	0	240	121
Assumptions	Assumes 11 acres per year.	Assumes 0 acres per year.	Assumes 12 acres per year.	Assumes 6 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	220	0	240	121
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Fence Development</i>				
Acres Short-Term Disturbance from BLM Actions	443.8	0	1,432	620
Assumptions	Assumes 22.19 acres per year.	Assumes no fences.	Assumes 71.6 acres per year.	Assumes 31 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	443.8	0	1,432	620
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<i>Well Development</i>				
Acres Short-Term Disturbance from BLM Actions	113.8	0	236	60.4
Assumptions	Assumes 5.69 acres per year.	Assumes no wells.	Assumes 11.80 per year.	Assumes 3.02 acres per year.
Acres Reclaimed from BLM Actions	0	0	0	0
Acres Long-Term Disturbance from BLM Actions	113.8	0	236	60.4
Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
<b>Cumulative Disturbance</b>				
Total Acres Short-Term Disturbance from BLM Actions	52,591	74,689	160,065	53,894
Total Acres Reclaimed from BLM Actions	40,152	67,186	99,433	42,441
Total Acres Long-Term Disturbance from BLM Actions	12,439	7,502	60,631	11,453
Total Acres Short-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Total Acres Reclaimed from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown
Total Acres Long-Term Disturbance from Non-BLM Actions	Unknown	Unknown	Unknown	Unknown

Type of Disturbance	Alternative A	Alternative B	Alternative C	Alternative D
Cumulative Long-Term Acres of Disturbance	Unknown	Unknown	Unknown	Unknown
<p><sup>1</sup> Areas disturbed by mechanical fuels treatment will naturally be reclaimed within 3 to 5 years; areas disturbed by prescribed fire will naturally be reclaimed within 3 to 5 years.</p> <p><sup>2</sup> Approximately 50 percent of roads would be oil and gas related (based on the <i>Reasonable Foreseeable Development Scenario for Oil and Gas, Lander Field Office, Wyoming</i>).</p> <p><sup>3</sup> Historically, these facilities are oil and gas.</p> <p>AML abandoned mine land  BLM Bureau of Land Management  CBNG coalbed natural gas  ROW right-of-way  USFS United States Forest Service  WGFD Wyoming Game and Fish Department</p>				

Table T.2. Oil and Gas Reasonable Foreseeable Development Assumptions

Well Projections	Alternative A	Alternative B	Alternative C	Alternative D
<b>Well Projections on BLM-Administered Land for Existing Active Wells and All New Wells (short-term)</b>				
Existing Wells (total)	887	887	887	887
Non-coalbed Exploratory	113	113	113	113
Non-coalbed Development	722	722	722	722
Coalbed gas	5	5	5	5
Deep	47	47	47	47
New Wells (total)	2,274	1,528	2,284	2,125
Non-coalbed Exploratory	237	189	237	227
Non-coalbed Development	1,511	1,209	1,516	1,447
Coalbed gas	480	93	484	406
Deep	46	37	47	45
<b>Well Projections on BLM-Administered Land for All New Producing Wells and Existing Active Wells Less Abandonments (long-term)</b>				
Existing Wells (total)	675	675	675	675
Non-coalbed Exploratory	85	85	85	85
Non-coalbed Development	545	545	545	545
Coalbed gas	5	5	5	5
Deep	40	40	40	40
New Wells (total)	1,820	1,194	1,828	1,695
Non-coalbed Exploratory	142	113	142	136
Non-coalbed Development	1,209	967	1,213	1,158
Coalbed gas	432	84	436	365
Deep	37	30	38	36
<b>Well Projections on Non-BLM-Administered Land for Existing Active Wells and All New Wells (short-term)</b>				
Existing Wells	1,377	1,377	1,377	1,377
Non-coalbed Exploratory	180	180	180	180
Non-coalbed Development	1,148	1,148	1,148	1,148
Coalbed gas	23	23	23	23
Deep	26	26	26	26
New Wells	1,060	1,060	1,060	1,060
Non-coalbed Exploratory	94	94	94	94
Non-coalbed Development	596	597	596	597
Coalbed gas	343	343	343	343
Deep	27	26	27	26
<b>Well Projections on Non-BLM-Administered Land for All New Producing Wells and Existing Active Wells Less Abandonments (long-term)</b>				
Existing Wells	1,102	1,102	1,102	1,102
Non-coalbed Exploratory	145	145	145	145
Non-coalbed Development	926	926	926	926

Well Projections	Alternative A	Alternative B	Alternative C	Alternative D
Coalbed gas	11	11	11	11
Deep	20	20	20	20
New Wells	864	864	864	864
Non-coalbed Exploratory	56	56	56	56
Non-coalbed Development	477	478	477	478
Coalbed gas	309	309	309	309
Deep	22	21	22	21
Assumptions	Surface disturbance resulting from the well projections above assume the following acres of surface disturbance for each type of well from well pads, access roads, and flow lines: <ul style="list-style-type: none"><li>• Short-term well projections (new wells):<ul style="list-style-type: none"><li>○ Non-coalbed exploratory (12.5 acres of surface disturbance per well)</li><li>○ Non-coalbed development (6 acres of surface disturbance per well)</li><li>○ Coalbed gas (5.5 acres of surface disturbance per well)</li><li>○ Deep (16 acres of surface disturbance per well)</li></ul></li><li>• Long-term well projections:<ul style="list-style-type: none"><li>○ Non-coalbed exploratory (9 acres of surface disturbance per well)</li><li>○ Non-coalbed development (4 acres of surface disturbance per well)</li><li>○ Coalbed gas (3.5 acres of surface disturbance per well)</li><li>○ Deep (10 acres of surface disturbance per well)</li></ul></li></ul>			
Source: Reasonable Foreseeable Development Scenario for Oil and Gas, Lander Field Office, Wyoming (2009)				



# Appendix U. Technical Support Document for Air Resources

## U.1. Introduction

This air resources technical support document describes the data and methodology used to conduct and serve as the basis for the air quality impact analysis included in Chapter 4 of the Lander Resource Management Plan (RMP) and Environmental Impact Statement (EIS).

### U.1.1. Study Area

The study area for this analysis is focused on the Lander Field Office planning area and includes cumulative emission sources and potential impacts to Class I areas within 100 kilometers of the planning area. Federal Prevention of Significant Deterioration (PSD) Class I areas are afforded special protection under the 1970 Clean Air Act (CAA). This study includes the following Class I areas, which were selected due to their close proximity to the Lander Field Office.

- Bridger Wilderness Area
- Fitzpatrick Wilderness Area
- Washakie Wilderness Area
- Yellowstone National Park
- Teton Wilderness Area
- Grand Teton National Park

### U.1.2. Pollutants Addressed in the Analysis

The basic framework for controlling air pollutants in the United States is mandated by the CAA and its amendments and the 1999 Regional Haze Regulations. The CAA addresses criteria air pollutants, national ambient air quality standards for criteria air pollutants, the PSD program, and emission standards for hazardous air pollutants (HAPs). The Regional Haze Regulations address visibility impairment.

Criteria pollutants are those for which National Ambient Air Quality Standards (NAAQS) have been established. Ambient air concentrations of these constituents greater than the national standards represent a risk to human health. Criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), ozone (O<sub>3</sub>), particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>), and lead. Volatile organic compounds (VOCs) are a group of pollutants for which there is no established ambient air quality standard but which are regulated under the CAA. VOCs are organic compounds that participate in photochemical reactions in the atmosphere and are critical to ozone formation. HAPs are those pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological impacts. The United States Environmental Protection Agency (EPA) has issued reference concentrations for evaluating the inhalation risk for cancerous and noncancerous health impacts for chronic inhalation. Pollutants that are responsible for degradation of visibility and atmospheric deposition include sulfur and nitrogen compounds and fine particulate matter (PM<sub>2.5</sub>). Nitric acid and nitrate are not emitted directly into the air, but form in the atmosphere from industrial and automotive emissions of nitrogen oxides (NO<sub>x</sub>). Sulfate is formed in the atmosphere from

industrial emissions of SO<sub>2</sub>. Deposition of these compounds can adversely impact terrestrial and aquatic vegetation, soil chemistry, and aquatic chemistry. Ambient concentrations of these pollutants can cause reduced visibility (haze). Greenhouse gases (GHGs) are those pollutants that are effective at trapping heat in the earth's atmosphere and have been attributed to climate change. These pollutants include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O).

The air pollutants addressed in this analysis included criteria pollutants (NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, CO, SO<sub>2</sub>, and O<sub>3</sub>), VOCs, HAPs, and GHGs (specifically CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O). These pollutants were included in this analysis because: 1) they were identified as compounds that had potential to be emitted by management actions and activities within the planning area; 2) sufficient production and operational data was available to estimate emissions; and, 3) scientifically defensible or actual emission factors were available to quantify emissions. Lead, a criteria pollutant, was primarily a concern before the widespread use of unleaded gasoline and emissions from fuel combustion were a concern. Lead was not included in this analysis as emissions from projected activities would be negligible. Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride were not included in the analysis of GHGs because the proposed management activities and actions are not typically sources of these pollutants and emissions would be negligible or zero.

### U.1.3. Thresholds of Significance

#### *Criteria Pollutants*

In order to protect and enhance the quality of the nation's air resources, EPA established NAAQS. Wyoming Department of Environmental Quality (DEQ) has established Wyoming Ambient Air Quality Standards (WAAQS). Primary standards are set at the level required to protect human health with an "adequate margin of safety" and must safeguard the public as a whole. Secondary standards are set at the level that protects public welfare, which is defined to include all forms of environmental damage, including but not limited to impacts on visibility, water, soil, and climate. Table U.1, "National and Wyoming Ambient Air Quality Standards" (p. 1546) shows the analysis of the proposed alternatives for project specific EISs, and compares cumulative concentrations of air pollutants to the NAAQS and WAAQS. The Bureau of Land Management (BLM) cannot authorize any activity that would not conform to all applicable local, state, tribal, and federal air quality laws, regulations, standards.

**Table U.1. National and Wyoming Ambient Air Quality Standards**

Pollutant	Averaging Time	National Ambient Air Quality Standards						Wyoming Ambient Air Quality Standards		
		Primary			Secondary			Primary		
		(ppm)	(ppb)	(µg/m <sup>3</sup> )	(ppm)	(ppb)	(µg/m <sup>3</sup> )	(ppm)	(ppb)	(µg/m <sup>3</sup> )
Carbon Monoxide	1 hour	<b>35 (a)</b>	35,000	40,000	None			35	35,000	<b>40 (mg/m<sup>3</sup>)</b>
	8 hour	<b>9 (a)</b>	9,000	10,000	None			9	9,000	<b>10 (mg/m<sup>3</sup>)</b>
Lead	Rolling 3-month	---	---	<b>0.15</b>	Same as Primary			---	---	---
	Quarterly	---	---	<b>1.50</b>	Same as Primary			---	---	<b>1.50</b>
Nitrogen Dioxide	1 hour	0.1	<b>100 (b)</b>	189	None			---	---	---
	Annual (Arithmetic Mean)	<b>0.053</b>	53	100	Same as Primary			0.05	50	<b>100</b>

Pollutant	Averaging Time	National Ambient Air Quality Standards						Wyoming Ambient Air Quality Standards		
		Primary			Secondary			Primary		
		(ppm)	(ppb)	( $\mu\text{g}/\text{m}^3$ )	(ppm)	(ppb)	( $\mu\text{g}/\text{m}^3$ )	(ppm)	(ppb)	( $\mu\text{g}/\text{m}^3$ )
PM <sub>10</sub>	24 hour	---	---	<b>150</b> (c)	Same as Primary			---	---	<b>150</b> (c)
	Annual (Arithmetic Mean)	None			None			---	---	<b>50</b>
PM <sub>2.5</sub>	24 hour	---	---	35 (d)	Same as Primary			---	---	<b>35</b> (h)
	Annual (Arithmetic Mean)	---	---	15.0 (e)	Same as Primary			---	---	<b>15.0</b> (e)
Ozone	8 hour	<b>0.075</b> (f)	75	147	Same as Primary			<b>0.08</b>	80	157
Sulfur Dioxide	1 hour	0.075	<b>75</b> (g)	197	None			---	---	---
	3 hour	None			<b>0.5</b> (a)	500	1,300	0.50	500	<b>1,300</b>
	24 hour	<b>0.14</b> (a)	140	365	None			0.10	100	<b>260</b>
	Annual (Arithmetic Mean)	<b>0.03</b>	30	80	None			0.02	20	<b>60</b>
Hydrogen Sulfide	1/2 hour average	---	---	---	---	---	---	0.05	50	<b>70</b> (i)
	1/2 hour average	---	---	---	---	---	---	0.03	30	<b>40</b> (i)

Note: **Bold** indicates the standard as written in the corresponding regulation. Other values are conversions.

(a) Not to be exceeded more than once per year. (b) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010). (c) Not to be exceeded more than once per year on average over 3 years. (d) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35  $\mu\text{g}/\text{m}^3$  (effective December 17, 2006). (e) To attain this standard, the 3-year average of the weighted annual mean PM<sub>2.5</sub> concentrations from single or multiple community-oriented monitors must not exceed 15.0  $\mu\text{g}/\text{m}^3$ . (f) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008) NOTE: new standard to be finalized Aug. 2010 (g) To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (effective June 2, 2010). (h) Effective Jan. 1, 2011. (i) Not to be exceeded more than two times per year. (j) Not to be exceeded more than two times in any five consecutive days.

ppb parts per billion

ppm parts per million

$\mu\text{g}/\text{m}^3$  micrograms per cubic meter

The CAA includes provisions for the PSD in designated areas. The goal of the PSD program is “to preserve, protect and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores and other areas of special national or regional natural, recreation, scenic or historic value.” A classification system was established identifying allowable amounts of additional air quality degradation (increments) which would be allowed above legally established baseline levels (Table U.2, “Prevention of Significant Deterioration Increments” (p. 1548)). PSD Class I areas have the greatest limitations, with a very limited amount of additional degradation allowed, primarily national parks and wilderness areas. The remainder of the nation (outside non-attainment and maintenance areas) was designated as PSD Class II areas, where moderate deterioration and controlled growth is allowed. In its project specific EISs, BLM may compare cumulative concentrations of air pollutants to the PSD increments as an indication of a level of concern.

**Table U.2. Prevention of Significant Deterioration Increments**

Pollutant	Averaging Period	PSD Increment – Class I ( $\mu\text{g}/\text{m}^3$ )	PSD Increment – Class II ( $\mu\text{g}/\text{m}^3$ )
Sulfur Dioxide ( $\text{SO}_2$ )	3 hour	25	512
	24 hour	5	91
	Annual	21	20
Particulate Matter ( $\text{PM}_{10}$ )	24 hour	8	30
	Annual	4	17
Nitrogen Dioxide ( $\text{NO}_2$ )	Annual	2.5	25
Carbon Monoxide (CO)	1 hour	None	None
	8 hour	None	None
Lead 3 months	3 months	None	None
Source: 40 CFR 51.166(c)			
PSD Prevention of Significant Deterioration $\mu\text{g}/\text{m}^3$ micrograms per cubic meter			

### ***Hazardous Air Pollutants***

Section 112 of the CAA lists more than 180 chemicals as HAPs. In addition, Sections 112(d) and 112(g) require regulatory agencies to establish Maximum Achievable Control Technology (MACT) Standards for sources that emit HAPs. Any source that emits or has the potential to emit 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAPs is considered a major source and will require a Title V, Part 70, operating permit review and permit. In addition to MACT standards, EPA has listed (on its Air Toxics Database) Reference Exposure Levels (RELs) for many of the HAPs. RELs are defined as concentrations at or below which no adverse health effects are expected.

### ***Visibility***

Changes in visibility or regional haze are caused by fine particles and gases scattering and absorbing light. A 1.0 deciview (dv) change in light extinction is considered potentially significant in mandatory Federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 CFR §51.300 et seq.). A 1.0-dv change is defined as approximately a 10 percent change in the extinction coefficient (corresponding to a 2 to 5 percent change in contrast, for a black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory Federal Class I areas. For multi-source projects located within range of a Class I area, changes in extinction of less than 5 percent (0.5 dv) are generally considered unlikely to result in adverse impacts to visibility. Changes in extinction greater than 10 percent (1.0 dv) are generally considered unacceptable and will likely require additional more refined impact analysis typically including an evaluation of mitigation measures.

### ***Atmospheric Deposition***

The National Park Service (NPS) and United States Fish and Wildlife Service (USFWS) have established thresholds to evaluate nitrogen and sulfur deposition within Class I areas. These deposition analysis thresholds (DATs) are defined as 0.005 kilogram per hectare per year (kg/ha/yr) in the western United States for both nitrogen and sulfur. These thresholds are typically used to analyze project alone impacts. Cumulative impacts are typically compared to the level of concern, which is defined by the NPS and USFWS as 3 kg/ha/yr for N and 5 kg/ha/yr for

sulfur (Fox et al.1989) in Rocky Mountain regions. Deposition rates that are below the level of concern are believed to cause no adverse impacts.

### ***Lake Chemistry***

The USFWS considers lake chemistry changes to be potentially significant if the screening methodology predicts decreases in acid neutralizing capacity (ANC) of more than defined limits of acceptable change (LAC). A lake's LAC depends on its background ANC value. The LAC is defined as a 10 percent change for lakes with ANC background values greater than 25 microequivalents per liter (meq/l) and is defined as a change of 1 meq/l for lakes with ANC background values less than 25 meq/l. If a lake's ANC is predicted to decrease by more than the applicable LAC then potential changes to lake chemistry may cause adverse effects and a more detailed analysis of lake chemistry impacts would be required.

## **U.1.4. Emissions Generating Activities Included in Analysis**

Air pollutant emissions were estimated for 11 different types of management actions or activities that were identified as having the potential to generate emissions of the specified pollutants. The following is a list summarizing the 11 sectors and the specific activities under each sector for which potential emissions were quantified.

### ***Leasable Minerals – Conventional Oil and Gas Development***

- Well pad and compressor station pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well completion flares
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors
- Dehydrator, separator, and water tank heaters
- Dehydrator vents
- Tank venting, flashing, and loadout
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion

### ***Leasable Minerals – Coalbed Natural Gas Development***

- Well pad, compressor station pad, and water disposal well pad construction
- Road construction and maintenance
- Well drilling, completion, and testing
- Well workovers
- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Natural gas fired compressors

- Dehydrator and tank heaters
- Dehydrator vents
- Wellhead equipment leaks
- Pneumatic pumps and devices
- Well pad and road reclamation
- Wind erosion

#### ***Locatable Minerals – Bentonite Mining***

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Exploratory drilling
- Exploratory excavation and reclamation
- Mine development excavation and reclamation
- Product handling, transfer, and storage

#### ***Locatable Minerals – Gold Mining***

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Exploratory drilling
- Exploratory excavation and reclamation
- Mine development excavation and reclamation
- Product handling, transfer, and storage

#### ***Locatable Minerals – Uranium Mining***

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Injection well, production well, and monitoring well construction
- Well drilling and workovers
- Road and pipeline construction
- Road and well pad maintenance and reclamation
- Transport of resin

#### ***Salable Minerals – Sand, Gravel, and other Mineral Development***

- Construction vehicle exhaust and fugitive dust
- Maintenance vehicle exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Product handling, transfer, and storage
- Wind erosion

#### ***Fire Management and Ecology – Planned and Prescribed Fire***

- Heavy equipment exhaust and fugitive dust
- Commuting vehicle exhaust and fugitive dust
- Mechanical equipment (chainsaws, etc.) exhaust
- Smoke from prescribed fire

***Vegetation – Forests, Woodlands, and Aspen Communities Management***

- Heavy equipment and mechanical equipment exhaust and fugitive dust associated with tree harvesting, pole and post harvesting, firewood collection, tree salvaging, and weed control
- Commuting vehicle exhaust and fugitive dust

***Land Resources – Renewable Energy, Rights-of-Way, and Corridor Projects***

- Heavy equipment and mechanical equipment exhaust and fugitive dust associated with the construction of wind energy projects, telephone and fiber optics sites, pipelines, roads, powerlines, and communication sites.
- Commuting vehicle exhaust and fugitive dust

***Land Resources – Comprehensive Trails and Travel Management***

- Recreation trail and road maintenance
- Off-highway vehicles (OHVs)

***Land Resources – Livestock Grazing***

- Heavy equipment exhaust and fugitive dust associated with construction of springs, reservoirs, wells, pipelines, fences, and reservoir maintenance
- Commuting vehicle exhaust and fugitive dust
- Enteric fermentation and manure

There were some management activities that emissions were not estimated for because development potential was low, emissions were considered to be minor, or insufficient data was available to calculate emissions. Emissions from the following management actions were not estimated because the potential for development was considered low: coal mining, phosphate mining, oil shale development, geothermal development, gemstones and lapidary materials development. Emissions from the following management actions were not estimated because: (1) the level of activity is not expected to change between alternatives, (2) the magnitude of emissions from the activity is considered to be very small in comparison to other management activities, or (3) sufficient operational or production data was not available to quantify emissions: wildfires, invasive species and pest management, grassland and shrub land management, wild horse management and activities related to heritage and visual resources, socioeconomic resources, and fish and wildlife resources.

## **U.2. Methodology**

The air quality impact analysis included compiling an emissions inventory for existing conditions within the planning area as well as for projected future development. Emissions were estimated for each alternative and a comparative analysis was conducted. Emissions were based on reasonable future actions that were identified as having the potential to result in increased emissions of air pollutants. Emission estimates calculated for this analysis should not be assumed to be a definitive representation of future emissions. Depending on future economic conditions, mining and drilling methods, air pollution control technologies, and other factors that influence the pace of development, actual future emissions could be considerably different than presented. In addition, the size, location, and pace of development for future projects are not well known at this planning stage. For these reasons, it was determined that air quality modeling would not be included in this analysis. The input data required to conduct a modeling analysis was not available

and although “surrogate” input data could be used to force model results, those results would not be valuable to the decision maker or the public. As part of the National Environmental Policy Act (NEPA) analysis for actual development projects, the BLM will conduct an air quality analysis that will include air dispersion modeling of both project and cumulative impacts for those projects that may have a significant impact on air quality within the planning area.

For this analysis, air pollutant emissions were estimated over the 20 year life of project (LOP) for three specific years. The base year selected was 2008 because actual production, operational, and development data was most recently available for this year. The year 2018 was selected for the short-term year as development and construction projections for this year were the greatest across all resources. The year 2027 was selected as being representative of operational emissions over the long term. This section gives specific details on how emissions were estimated for the air resources analysis. The tables located in Section U.4, “Summary of Emissions” (p. 1560), at the end of this appendix summarize the projected total annual emissions by resource for 2008, 2018, and 2027.

## U.2.1. Emission Calculations by Category

### *Leasable Minerals – Conventional Oil and Gas Development and Coalbed Natural Gas Development*

The basis for emission calculations for conventional oil and gas development was the Reasonable Foreseeable Development (RFD) Scenario for Oil and Gas, Lander Field Office (BLM 2009d). According to the RFD up to 2,517 new conventional oil and natural gas wells and 827 coalbed natural gas (CBNG) wells may be drilled within the Lander Field Office planning area during the next 20 years. These numbers reflect the maximum level of development that can be expected during this time period. Table U.3, “Number of Existing and Proposed Wells by Alternative” (p. 1552) shows the number and types of wells for each alternative for both BLM wells and for non-BLM (private, state, or other federal) wells.

**Table U.3. Number of Existing and Proposed Wells by Alternative**

	Conventional Wells (Non-BLM)	Conventional Wells (BLM)	CBNG Wells (Non-BLM)	CBNG Wells (BLM)
<b>Existing</b>	2,236	882	28	5
<b>Year – 2018</b>				
Alternative A	2,511	1,794	823	480
Alternative B	2,152	1,435	436	93
Alternative C	2,517	1,800	827	484
Alternative D	2,436	1,719	749	406
<b>Year – 2027</b>				
Alternative A	1,942	1,388	741	432
Alternative B	1,665	1,110	392	84
Alternative C	1,948	1,392	744	436
Alternative D	1,885	1,330	674	365
Source: BLM 2009d				
BLM Bureau of Land Management				
CBNG coalbed natural gas				

The following list identifies the assumptions and sources of information used in the calculations of emissions for this category:

*Appendix U Technical Support Document for Air Resources*  
*Emission Calculations by Category*

September 2011



- Emission factors for drill rig engines, diesel powered heavy (construction) equipment, generator engines, and other oil field equipment were obtained from EPA NONROADS 2008a Emissions Model (EPA 2009c).
- Emission factors for natural gas fired compressor engines were based on NSPS Emission Standards for Spark Ignition Engines 40 CFR Part 60 JJJJ, recent Best Available Control Technology (BACT) determinations by Wyoming DEQ, EPA's AP-42 Compilation of Air Pollutant Emission Factors (EPA 1995a), and American Petroleum Institute's (API) Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).
- Emission factors for on-road vehicles were obtained from EPA's MOBILE6.2 Motor Vehicle Emission Factor Model (EPA 2006).
- Emission factors for VOC and HAPs emissions oil and gas sources were based on EPA's AP-42, EPA's Protocol for Equipment Leak Emissions Estimates (EPA 1995b), Gas Technology Institute GRI-GLYCalc 4.0 emissions estimating software (GTI 2000), EPA's Natural Gas STAR Program (EPA No Date), Wyoming DEQ's Oil and Gas Production Facilities Permitting Guidance, Chapter 6, Section 2 revised March 2010 (Wyoming DEQ 2010b), and field gas analyses from the planning area.
- Activity and equipment data were obtained from resource specialists in the Lander Field Office, existing operator experience from producing fields in the planning area, and professional judgment.
- It was assumed that (1) natural gas fired engines would be equipped with non-selective catalytic reduction technology, (2) VOC and HAP emissions from dehydrators, tank flashing, pneumatic pumps, and produced water tanks would be controlled to 98 percent efficiency per Wyoming DEQ BACT, (3) and drill rig engines would comply with Tier II or better emission standards.
- It was assumed that water application as a best management practice (BMP) would reduce fugitive dust emissions from ground-disturbing activities during construction and reclamation activities and maintenance of roads by 50 percent from uncontrolled levels.

### ***Locatable Minerals – Bentonite Mining***

Emissions estimates for future bentonite mining were based on operating data from the one existing bentonite mine in the planning area and development potential estimated in the Final Mineral Occurrence and Development Potential Report (BLM 2009c). Because alternatives A and C would include the fewest restrictions on potential bentonite mining, it was assumed that in addition to the existing mine, two additional mines with similar operational characteristics would be operational in 2018 and 2027. Because of the additional restrictions on mineral development and the location of designated Areas of Critical Environmental Concern under Alternative B, it was assumed that only the existing mine would operate in the future. For Alternative D it was assumed that the existing mine and one additional mine would be operational in 2018 and 2027. Emission factors for this category were obtained from EPA's AP-42 (EPA 1995a), EPA's NONROADS 2008a Emissions model (EPA 2009c), EPA's MOBILE6.2 motor vehicle emission factor model (EPA 2006), and API's Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry (American Petroleum Institute 2009).

### ***Locatable Minerals – Gold Mining***

Emissions estimates for future gold mining were based on the Decision Record and Environmental Assessment for the Rattlesnake Hills Gold Exploration Drilling Project, (BLM 2010j) located in the planning area, development potential estimated in the Final Mineral Occurrence and

Development Potential Report (BLM 2009c), and existing exploratory operations. It was assumed that the gold mining operations in the planning area consist of typical surface mining techniques and all processing is done offsite outside of the planning area. It was assumed that gold mining operations would be similar for all alternatives. Future emissions were based on the assumption that exploratory operations would continue and one mine similar to the proposed Rattlesnake Hills Project would be operational in 2018 and 2027. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, and EPA's MOBILE6.2 motor vehicle emission factor model.

### ***Locatable Minerals – Uranium Mining***

Emission estimates for future uranium mining were based on the Plan of Operations for the proposed Gas Hills project, development potential estimated in the Final Mineral Occurrence and Development Potential Report (BLM 2009c), and existing exploratory operations. It was assumed that all future uranium mining will utilize in-situ recovery rather than open-pit mining. Future emissions were based on the assumption that exploratory operations would continue and two mines similar to the proposed Gas Hills Project would be operational in 2018 and 2027 for alternatives. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, EPA's MOBILE6.2 motor vehicle emission factor model, and API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry.

### ***Salable Minerals – Sand, Gravel, and other Mineral Development***

Emissions were estimated for this category primarily for sand and gravel sales and free use permits but also included moss rock, limestone, and soil and fill permits and sales. Existing emission calculations were based on the average of permit and sales records from 1989 – 2009. Future emission calculations were based on the permit and sales records and the Final Mineral Occurrence and Development Potential Report (BLM 2009c). Future emissions were calculated using estimated tons of material to be processed for each alternative. Emission factors for this category were obtained from EPA's AP-42, EPA's NONROADS 2008a Emissions model, and EPA's MOBILE6.2 motor vehicle emission factor model.

### ***Fire Management and Ecology – Planned and Prescribed Fire***

Emission estimates for fire management were based on the number of acres of disturbance projected for each alternative for mechanical treatments and for prescribed burning. Emissions factors for mechanical treatments (heavy equipment, all terrain vehicles, and chain saws) were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model. Emission factors for PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CO, VOCs, CH<sub>4</sub>, and N<sub>2</sub>O from smoke were obtained from Western Governors Association/Western Regional Air Partnership (WRAP) 2002 Fire Emission Inventory for the WRAP Region-Phase II (WRAP 2005).

### ***Vegetation – Forests, Woodlands, and Aspen Communities Management***

Emissions were estimated for this category for activities related to forest management (silviculture, insect control, and forest products harvesting) and were based on the numbers of acres of surface disturbance projected for each alternative. Emission factors for heavy equipment and logging equipment used in these activities were obtained from EPA's NONROADS 2008a

Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model.

### ***Land Resources – Renewable Energy, Rights-of-Way, and Corridor Projects***

Emissions were estimated for this category for several surface-disturbing projects under Land Resources. Table U.4, "Basis for Emissions Calculations for Land Resources Projects" (p. 1555) shows the key criteria projected under each alternative that were used to as the basis for emissions calculations. Emission factors for surface-disturbing activities were obtained from EPA's AP-42. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model.

**Table U.4. Basis for Emissions Calculations for Land Resources Projects**

Type of Project	Alternative A	Alternative B	Alternative C	Alternative D
Wind energy projects - acres of disturbance for life of project (20 years)	2,250	0	108,000	2,250
Wind energy projects - number of turbines	50	0	2,400	50
Telephone and fiber optics projects - acres of disturbance per year	13.43	2.68	13.83	7.22
Pipelines projects - acres of disturbance per year	447	351	460	427
Roads (non-mineral) projects - acres of disturbance per year	231.8	46.36	237.93	115.5
Powerline projects - acres of disturbance per year	98.46	19.69	101.41	49.23
Communication sites - acres of disturbance per year	20.64	9.64	21.46	9.64
Other - acres of disturbance per year	39	30.61	40	37.32

### ***Land Resources – Comprehensive Trails and Travel Management***

Emission sources under this category included road maintenance within the planning area (recreational roads only, mineral development roads were included in those categories), trail maintenance (including cross-country ski trail grooming), and OHV use within the planning area. Road and trail maintenance emissions were estimated using historical data on miles maintained per year and equipment use. Future emissions were based on the number of miles to be maintained for each alternative. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model. OHV emissions were estimated using EPA's NONROADS 2008a Emissions model which calculated annual emissions based on EPA's National Emissions Inventory and county population for 2005. Emissions were then projected for 2008, 2018, and 2027. It was assumed that OHV use would not change by alternative. Emission factors for surface-disturbing activities were obtained from EPA's AP-42.

### ***Land Resources – Livestock Grazing***

Emissions were estimated for six construction activities related to livestock grazing: springs, wells, fence, reservoir, and pipeline construction and reservoir maintenance. Emission estimates for these activities were based on the number of acres of disturbance projected for each activity under each alternative. In addition, methane emissions related to animal enteric fermentation and manure deposits were calculated for estimated head of cattle, sheep, and horses projected for each alternative based on current livestock grazing permits. Emission factors for heavy equipment used in these activities were obtained from EPA's NONROADS 2008a Emissions model and emission factors for commuting vehicles were obtained from EPA's MOBILE6.2 motor vehicle emission factor model. Emission factors for enteric fermentation and manure management were obtained from the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC 2006).

## **U.3. Mitigation and BMPs**

The following table (Table U.5, "Options for Air Quality Mitigation in the Planning Area" (p. 1556)) outlines options for air quality mitigation in the planning area.

**Table U.5. Options for Air Quality Mitigation in the Planning Area**

<b>Mitigation Measure</b>	<b>Environmental Benefits</b>	<b>Environmental Liabilities</b>	<b>Feasibility</b>
<b>Control Strategies for Drilling and Compression</b>			
Directional Drilling	Reduces construction related emissions (dust and vehicle and construction equipment emissions). Decreases surface disturbance and vegetation impacts (dust and CO <sub>2</sub> and nitrogen flux). Reduces habitat fragmentation	Could result in higher air impacts in one area with longer sustained drilling times.	Depends on geological strata
Improved engine technology (Tier 2 or better) for diesel drill rig engines	Reduced NO <sub>x</sub> , PM, CO, and VOC emissions		Dependent on availability of technology from engine manufacturers
SCR for drill rig engines and/or compressors	NO <sub>x</sub> emissions reduction, decreased formation of visibility impairing compounds, decreased formation of ozone. NO <sub>x</sub> control efficiency of 95% achieved on drill rig engines. NO <sub>x</sub> emission rate of 0.1 g/hp-hr achieved for compressors	Potential NH <sub>3</sub> emissions and formation of visibility impairing ammonium sulfate. Regeneration/disposal of catalyst can produce hazardous waste	Not applicable to 2-stroke engines

<b>Mitigation Measure</b>	<b>Environmental Benefits</b>	<b>Environmental Liabilities</b>	<b>Feasibility</b>
NSCR for drill rig engines and/or compressors	NO <sub>x</sub> emissions reduction, decreased formation of visibility impairing compounds, and decreased formation of ozone. NO <sub>x</sub> control efficiency of 80-90% achieved for drill rig engines. NO <sub>x</sub> emission rate of 0.7 g/hp-hr achieved for compressor engines greater than 100 hp.	Regeneration/disposal of catalysts can produce hazardous waste	Not applicable to lean burn or 2-stroke engines
Natural gas fired drill rig engines	NO <sub>x</sub> emissions reduction, decreased formation of visibility impairing compounds, and decreased formation of ozone		Requires onsite processing of field gas.
Electrification of drill rig engines and/or compressors	Decreased emissions at the source. Transfers emissions to more efficiently controlled source	Displaces emissions to EGU	Depends on availability of power and transmission lines
Improved engine technology (Tier 2 or better) for all mobile and non-road diesel engines	Reduced NO <sub>x</sub> , PM, CO, and VOC emissions		Dependent on availability of technology from engine manufacturers
Green (a.k.a. closed loop or flareless) completions	Reduction in VOC and CH <sub>4</sub> emissions. Reduces or eliminate flaring and venting and associated emissions. Reduces or eliminates open pits and associated evaporative emissions. Increased recovery of gas to pipeline rather than atmosphere.	Temporary increase in truck traffic and associated emissions	Need adequate pressure and flow. Need onsite infrastructure (tanks/dehydrator). Availability of sales line. Green completion permits required by Wyoming BACT in some areas
Green workovers	Same as above	Same as above	Same as above
Minimize venting and/or use closed loop process where possible during "blow downs"	Same as above		Best Management Practices required by Wyoming BACT
Eliminate open pits	Reduces VOC and GHG emissions. Reduces potential for soil and water contamination. Reduces odors.	May increase truck traffic and associated emissions.	Requires tank and/or pipeline infrastructure.
Electrification of wellhead compression/pumping	Reduces local emissions of fossil fuel combustion and transfers to more easily controlled source.	Displaces emissions to EGU	Depends on availability of power and transmission lines
Wind (or other renewable) generated power for compressors	Low or no emissions.	May require construction of infrastructure. Visual impacts. Potential wildlife impacts.	Depends on availability of power and transmission lines
<b>Control Strategies Utilizing Centralized Systems</b>			

<b>Mitigation Measure</b>	<b>Environmental Benefits</b>	<b>Environmental Liabilities</b>	<b>Feasibility</b>
Centralization (or consolidation) of gas processing facilities (separation, dehydration, sweetening, etc.)	Reduced long-term truck traffic and associated emissions. Reduced VOC and GHG emissions from individual dehydrator/separator units.	Temporary increase in construction associated emissions.	Requires pipeline infrastructure.
Liquids Gathering systems (for condensate and produced water)	Reduced long-term truck traffic and associated emissions. Reduced VOC and GHG emissions from tanks.	Temporary increase in construction associated emissions.	Requires pipeline infrastructure.
Water and/or fracturing liquids delivery system	Reduced long-term truck traffic and associated emissions.	Temporary increase in construction associated emissions unless place above ground.	Requires pipeline infrastructure. Not feasible for some terrain.
<b>Control Strategies for Tanks, Separators, and Dehydrators</b>			
Eliminate use of open top tanks	Reduced VOC and GHG emissions		Required by Wyoming BACT for produced water tanks in some areas.
Capture and control of flashing emissions from all storage tanks and separation vessels with vapor recovery and/or thermal combustion units.	Reduces VOC and GHG emissions.		98% VOC control if $\geq 10$ TPY required statewide by Wyoming BACT
Capture and control of produced water tank emissions.	Reduces VOC and GHG emissions.		98% VOC control and no open top tanks required by Wyoming DEQ in some areas
Capture and control of dehydration equipment emissions with condensers, vapor recovery, and/or thermal combustion	Reduces VOC, HAP, and GHG emissions		Still vent condensers required and 98% VOC control if $\geq 8$ TPY required statewide and in CDA by Wyoming BACT. All dehydration emissions controlled at 98% in JPAD (no 8 TPY threshold)
<b>Control Strategies for Misc. Fugitive VOC Emissions</b>			
Install and maintain low VOC emitting seals, valves, hatches on production equipment	Reduces VOC and GHG emissions.		
Initiate an equipment leak detection and repair program (including use of FLIR cameras, grab samples, organic vapor detection devices, visual inspection, etc.)	Reduction in VOC and GHG emissions		
Install or convert gas operated pneumatic devices to electric, solar, or instrument (or compressed) air driven devices/controllers	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	

Mitigation Measure	Environmental Benefits	Environmental Liabilities	Feasibility
Use "low" or "no bleed" gas operated pneumatic devices/controllers	Reduces VOC and GHG emissions.		Or closed loop required statewide by Wyoming BACT
Use closed loop system or thermal combustion for gas operated pneumatic pumps.	Reduces VOC and GHG emissions.		Required statewide by Wyoming BACT (98% VOC control or closed loop)
Install or convert gas operated pneumatic pumps to electric, solar, or instrument (or compressed) air driven pumps	Reduces VOC and GHG emissions.	Electric or compressed air driven operations can displace or increase combustion emissions.	Required statewide by Wyoming BACT if no thermal combustion used.
Install vapor recovery on truck loading/unloading operations at tanks	Reduces emissions of VOC and GHG emissions.		Wyoming BACT analysis required if $VOC \geq 8$ TPY or $HAP \geq 5$ TPY.
<b>Control Strategies for Fugitive Dust and Vehicle Emissions</b>			
Unpaved surface treatments including watering, chemical suppressants, and gravel.	20% - 80% control of fugitive dust (particulates) from vehicle traffic.	Potential impacts to water and vegetation from runoff of suppressants.	
Use remote telemetry and automation of wellhead equipment	Reduces vehicle traffic and associated emissions.		
Speed limit control and enforcement on unpaved roads	Reduction of fugitive dust emissions		
Reduce commuter vehicle trips through car pools, commuter vans or buses, innovative work schedules, or work camps	Reduced combustion emissions, reduced fugitive dust emissions, reduced ozone formation, reduced impacts to visibility		
<b>Miscellaneous Control Strategies</b>			
Use of ultra-low sulfur diesel in engines, compressors, construction equipment, etc.	Reduces emissions of particulates and sulfates		Fuel not readily available in some areas.
Reduce unnecessary vehicle idling	Reduced combustion emissions, reduced ozone formation, reduced impacts to visibility, reduced fuel consumption		
Reduced pace of (phased) development	Peak emissions of all pollutants reduced	Emissions generated at a lower rate but for a longer period	May not be economically viable.
BACT Best Available Control Technology CO Carbon Monoxide CO <sub>2</sub> Carbon Dioxide DEQ Department of Environmental Quality EGU electric generating unit FLIR Forward Looking Infrared Radiometer g/hp-hr gallons per horsepower hour GHG greenhouse gas HAP Hazardous Air Pollutant		JPAD Joint Precision Airdrop System Misc. Miscellaneous NH <sub>3</sub> Ammonia NO <sub>x</sub> Nitrogen Oxides PM particulate matter SCR Selective Catalytic Reduction TPY tons per year VOC Volatile Organic Compound	

## **U.4. Summary of Emissions**

The following tables summarize the projected total annual emissions for each alternative by resource for years 2008, 2018, and 2027.



**Table U.6. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	7	7	134	3	36	10	1	15,524	0	0	15,576	14,090
Well Completion Flaring	0	0	2	0	11	63	6	2	0	0	2	2
Commuting Vehicles - Construction	28	3	1	0	1	0	0	280	0		281	255
Wind Erosion	6	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	59	13	137	3	49	73	7	15,806	0	0	15,859	14,347
Natural Gas Compression - Operations a	11	11	308	1	154	154	46	123,032	257	1	128,778	117,047
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	172	0	0	172	156
Dehy Venting and Flashing	---	---	---	---	---	241	91	2,623	160		5,981	5,738
Station Visits - Operations	23	2	0	0	1	1	0	81	0		81	73
Well Workover - Operations	0	0	2	0	1	0	0	317	0	0	318	287
Well & Pipeline Visits for Inspection & Repair - Operations	29	3	0	0	1	0	0	49	0		49	45
Tanks Condensate and Loadout	---	---	---	---	---	282	28	20	47		1,005	1,003
Wellhead Fugitives	---	---	---	---	---	430	43	254	3,947		83,149	83,125
Pneumatic Devices	---	---	---	---	---	316	32	186	2,899		61,066	61,049
Sub-total: Operations	63	16	311	1	157	1,425	240	126,733	7,311	1	280,599	268,524
Road Maintenance	2	0	0	0	0	0	0	60	0		60	54
Sub-total: Maintenance	2	0	0	0	0	0	0	60	0	0	60	54
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	38	0		38	34
Sub-total: Reclamation	1	0	0	0	0	0	0	39	0	0	39	35

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	125	29	449	4	206	1,498	247	142,638	7,311	1	296,557	282,961
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.7. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	31	31	904	2	452	452	136	361,003	755	3	377,862	343,440
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	505	0	0	506	458
Dehy Venting and Flashing	---	---	---	---	---	709	266	7,696	469		17,549	16,836
Station Visits - Operations	69	7	1	0	4	2	0	237	0		237	215
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	84	8	1	0	2	1	0	145	0		145	132
Tanks Condensate and Loadout	---	---	---	---	---	826	83	57	138		2,950	2,944
Wellhead Fugitives	---	---	---	---	---	1,263	126	744	11,582		243,975	243,907
Pneumatic Devices	---	---	---	---	---	928	93	546	8,506		179,182	179,131
Sub-total: Operations	185	47	913	2	460	4,181	703	371,883	21,451	3	823,358	787,926
Road Maintenance	5	1	1	0	0	0	0	176	0		176	159
Sub-total: Maintenance	5	1	1	0	0	0	0	176	0	0	176	159
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	110	0		110	100
Sub-total: Reclamation	4	0	0	0	0	0	0	114	0	0	114	103

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	371	87	1,325	11	607	4,401	725	419,580	21,451	4	871,212	831,219
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.8. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative A – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	24	24	696	1	348	348	104	277,632	581	2	290,598	264,126
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	388	0	0	389	353
Dehy Venting and Flashing	---	---	---	---	---	545	204	5,918	361		13,496	12,948
Station Visits - Operations	53	5	1	0	3	1	0	183	0		183	166
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	65	6	1	0	2	1	0	111	0		111	101
Tanks Condensate and Loadout	---	---	---	---	---	636	64	44	106		2,269	2,264
Wellhead Fugitives	---	---	---	---	---	971	97	572	8,908		187,631	187,578
Pneumatic Devices	---	---	---	---	---	713	71	420	6,542		137,801	137,762
Sub-total: Operations	143	36	704	2	354	3,215	541	286,219	16,497	3	633,431	606,160
Road Maintenance	4	0	0	0	0	0	0	135	0		135	123
Sub-total: Maintenance	4	0	0	0	0	0	0	135	0	0	135	123
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	84	0		84	76
Sub-total: Reclamation	3	0	0	0	0	0	0	87	0	0	87	79

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	326	76	1,115	11	501	3,435	563	333,848	16,497	3	681,217	649,391
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.9. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric Tonnes
Well Pad & Station Construction - Fugitive Dust	42	4	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	18	17	322	7	87	24	2	37,272	0	0	37,397	33,830
Well Completion Flaring	1	0	5	0	27	151	15	5	0	0	5	5
Commuting Vehicles - Construction	68	7	3	0	3	1	0	676	0		676	614
Wind Erosion	16	2	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	143	31	329	7	117	176	18	37,953	0	0	38,078	34,448
Natural Gas Compression - Operations a	27	27	783	2	392	392	117	312,573	654	3	327,169	297,366
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	437	0	0	438	397
Dehy Venting and Flashing	---	---	---	---	---	613	230	6,663	406		15,194	14,578
Station Visits - Operations	60	6	1	0	3	1	0	206	0		206	187
Well Workover - Operations	1	0	5	0	2	0	0	760	0	0	762	690
Well & Pipeline Visits for Inspection & Repair - Operations	73	7	1	0	2	1	0	126	0		126	114
Tanks Condensate and Loadout	---	---	---	---	---	716	72	50	119		2,554	2,549
Wellhead Fugitives	---	---	---	---	---	1,094	109	644	10,029		211,245	211,185
Pneumatic Devices	---	---	---	---	---	803	80	473	7,365		155,143	155,100
Sub-total: Operations	160	41	790	2	398	3,620	609	321,931	18,573	3	712,838	682,165
Road Maintenance	4	0	1	0	0	0	0	152	0		152	138
Sub-total: Maintenance	4	0	1	0	0	0	0	152	0	0	152	138
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	95	0		95	86
Sub-total: Reclamation	3	0	0	0	0	0	0	98	0	0	98	89

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric Tonnes
Total Emissions	312	73	1,120	9	516	3,796	627	360,134	18,573	3	751,166	716,840
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												



**Table U.10. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative B – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	42	4	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	18	17	322	7	87	24	2	37,272	0	0	37,397	33,830
Well Completion Flaring	1	0	5	0	27	151	15	5	0	0	5	5
Commuting Vehicles - Construction	68	7	3	0	3	1	0	676	0		676	614
Wind Erosion	16	2	---	---	---	---	---	---	---		---	---
Sub-total: Construction	143	31	329	7	117	176	18	37,953	0	0	38,078	34,448
Natural Gas Compression - Operations a	21	21	602	1	301	301	90	240,129	502	2	251,343	228,447
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	336	0	0	337	305
Dehy Venting and Flashing	---	---	---	---	---	471	177	5,119	312		11,673	11,199
Station Visits - Operations	46	5	1	0	2	1	0	158	0		158	143
Well Workover - Operations	1	0	5	0	2	0	0	760	0	0	762	690
Well & Pipeline Visits for Inspection & Repair - Operations	56	6	1	0	1	1	0	96	0		96	88
Tanks Condensate and Loadout	---	---	---	---	---	550	55	38	92		1,962	1,959
Wellhead Fugitives	---	---	---	---	---	840	84	495	7,704		162,286	162,240
Pneumatic Devices	---	---	---	---	---	617	62	363	5,658		119,187	119,153
Sub-total: Operations	123	31	608	1	306	2,781	468	247,494	14,268	2	547,803	524,222
Road Maintenance	3	0	0	0	0	0	0	117	0		117	106
Sub-total: Maintenance	3	0	0	0	0	0	0	117	0	0	117	106
Road Reclamation	0	0	0	0	0	0	0	2	0		2	2
Well Reclamation	3	0	0	0	0	0	0	73	0		73	66
Sub-total: Reclamation	3	0	0	0	0	0	0	75	0	0	75	68

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	273	63	938	9	424	2,957	485	285,639	14,269	3	586,074	558,845
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.11. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2018)

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	31	31	906	2	453	453	136	361,813	757	3	378,709	344,210
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	506	0	0	507	459
Dehy Venting and Flashing	---	---	---	---	---	710	266	7,713	470		17,588	16,874
Station Visits - Operations	69	7	1	0	4	2	0	238	0		238	216
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	84	8	1	0	2	1	0	145	0		145	132
Tanks Condensate and Loadout	---	---	---	---	---	828	83	58	138		2,956	2,951
Wellhead Fugitives	---	---	---	---	---	1,266	127	746	11,608		244,522	244,453
Pneumatic Devices	---	---	---	---	---	930	93	548	8,526		179,583	179,533
Sub-total: Operations	186	47	915	2	461	4,190	705	372,715	21,499	3	825,202	789,691
Road Maintenance	5	1	1	0	0	0	0	176	0		176	160
Sub-total: Maintenance	5	1	1	0	0	0	0	176	0	0	176	160
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	110	0		110	100
Sub-total: Reclamation	4	0	0	0	0	0	0	114	0	0	114	103

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	371	87	1,328	11	608	4,410	727	420,412	21,499	4	873,057	832,984
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.12. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative C – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	50	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	22	22	402	9	109	30	3	46,562	0	0	46,718	42,261
Well Completion Flaring	1	1	6	0	34	189	19	7	0	0	7	6
Commuting Vehicles - Construction	84	9	3	0	3	1	0	839	0		840	762
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	176	39	411	9	146	220	22	47,407	0	0	47,564	43,030
Natural Gas Compression - Operations a	24	24	697	1	348	348	105	278,172	582	3	291,162	264,639
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	389	0	0	390	353
Dehy Venting and Flashing	---	---	---	---	---	546	205	5,930	362		13,522	12,973
Station Visits - Operations	53	5	1	0	3	1	0	183	0		183	166
Well Workover - Operations	1	0	6	0	2	0	0	950	0	0	953	862
Well & Pipeline Visits for Inspection & Repair - Operations	65	6	1	0	2	1	0	112	0		112	101
Tanks Condensate and Loadout	---	---	---	---	---	637	64	44	106		2,273	2,269
Wellhead Fugitives	---	---	---	---	---	973	97	573	8,925		187,996	187,943
Pneumatic Devices	---	---	---	---	---	715	71	421	6,555		138,069	138,030
Sub-total: Operations	143	36	705	2	355	3,222	542	286,774	16,529	3	634,660	607,337
Road Maintenance	4	0	0	0	0	0	0	135	0		135	123
Sub-total: Maintenance	4	0	0	0	0	0	0	135	0	0	135	123
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	84	0		84	76
Sub-total: Reclamation	3	0	0	0	0	0	0	87	0	0	87	79

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	327	76	1,117	11	501	3,442	564	334,403	16,529	3	682,447	650,568
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.13. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	48	5	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	21	21	384	9	104	29	3	44,498	0	0	44,647	40,389
Well Completion Flaring	1	1	6	0	32	180	18	6	0	0	6	6
Commuting Vehicles - Construction	81	8	3	0	3	1	0	803	0		804	730
Wind Erosion	19	3	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	169	37	393	9	140	210	21	45,308	0	0	45,458	41,124
Natural Gas Compression - Operations a	30	30	879	2	440	440	132	350,885	734	3	367,271	333,815
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	491	0	0	492	446
Dehy Venting and Flashing	---	---	---	---	---	689	258	7,480	456		17,057	16,364
Station Visits - Operations	67	7	1	0	4	2	0	231	0		231	209
Well Workover - Operations	1	0	6	0	2	0	0	907	0	0	911	824
Well & Pipeline Visits for Inspection & Repair - Operations	82	8	1	0	2	1	0	141	0		141	128
Tanks Condensate and Loadout	---	---	---	---	---	803	80	56	134		2,867	2,862
Wellhead Fugitives	---	---	---	---	---	1,228	123	723	11,258		237,138	237,071
Pneumatic Devices	---	---	---	---	---	902	90	531	8,268		174,160	174,110
Sub-total: Operations	180	46	888	2	447	4,064	684	361,445	20,849	3	800,267	765,829
Road Maintenance	5	1	1	0	0	0	0	171	0		171	155
Sub-total: Maintenance	5	1	1	0	0	0	0	171	0	0	171	155
Road Reclamation	0	0	0	0	0	0	0	4	0		4	3
Well Reclamation	4	0	0	0	0	0	0	107	0		107	97
Sub-total: Reclamation	4	0	0	0	0	0	0	111	0	0	111	100

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	358	84	1,282	11	588	4,274	705	407,034	20,850	4	846,006	807,208
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												



**Table U.14. Leasable Minerals – Conventional Oil and Gas Development – Federal Wells (Alternative D – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	48	5	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	21	21	384	9	104	29	3	44,498	0	0	44,647	40,389
Well Completion Flaring	1	1	6	0	32	180	18	6	0	0	6	6
Commuting Vehicles - Construction	81	8	3	0	3	1	0	803	0		804	730
Wind Erosion	19	3	---	---	---	---	---	---	---		---	---
Sub-total: Construction	169	37	393	9	140	210	21	45,308	0	0	45,458	41,124
Natural Gas Compression - Operations a	23	23	676	1	338	338	101	269,808	564	2	282,408	256,682
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	377	0	0	378	343
Dehy Venting and Flashing	---	---	---	---	---	530	199	5,752	351		13,116	12,583
Station Visits - Operations	51	5	1	0	3	1	0	177	0		177	161
Well Workover - Operations	1	0	6	0	2	0	0	907	0	0	911	824
Well & Pipeline Visits for Inspection & Repair - Operations	63	6	1	0	2	1	0	108	0		108	98
Tanks Condensate and Loadout	---	---	---	---	---	618	62	43	103		2,205	2,201
Wellhead Fugitives	---	---	---	---	---	944	94	556	8,657		182,343	182,292
Pneumatic Devices	---	---	---	---	---	693	69	408	6,358		133,917	133,880
Sub-total: Operations	139	35	684	2	344	3,125	526	278,137	16,032	2	615,563	589,063
Road Maintenance	4	0	0	0	0	0	0	131	0		131	119
Sub-total: Maintenance	4	0	0	0	0	0	0	131	0	0	131	119
Road Reclamation	0	0	0	0	0	0	0	3	0		3	2
Well Reclamation	3	0	0	0	0	0	0	82	0		82	74
Sub-total: Reclamation	3	0	0	0	0	0	0	84	0	0	84	76

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	315	73	1,077	10	484	3,335	547	323,661	16,032	3	661,237	630,382
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.15. Leasable Minerals – CBNG Development – Federal Wells (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	1	0	0	0	0	116	0	0	117	106
Commuting Vehicles - Construction	0	0	0	0	0	0	0	7	0		7	6
Sub-total: Construction	1	0	1	0	0	0	0	123	0	0	123	112
Natural Gas Compression - Operations a	0	0	2	0	1	1	0	964	2	0	1,009	915
Dehydrators	0	0	0	0	0	0	0	132	0	0	132	120
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	0	0	0	12		244	221
Pneumatics	---	---	---	---	---	0	0	6	91		1,907	1,730
Station Visits - Operations	2	0	0	0	0	0	0	3	0		3	3
Well Workover - Operations	0	0	0	0	0	0	0	8	0	0	8	8
Well & Pipeline Visits for Inspection & Repair - Operations	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Operations	2	0	3	0	2	2	0	2,104	104	0	4,296	3,898
Road Maintenance	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Reclamation	0	0	0	0	0	0	0	0	0	0	0	0
Total Emissions	4	1	4	0	2	2	0	2,228	104	0	4,420	4,011

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.16. Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,718	0	0	2,726	2,474
Commuting Vehicles - Construction	10	1	1	0	1	0	0	149	0		149	135
Sub-total: Construction	26	4	21	1	8	2	0	2,866	0	0	2,875	2,609
Natural Gas Compression - Operations a	8	8	232	0	116	116	35	92,506	194	1	96,828	87,866
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	41	1,112		23,401	21,235
Pneumatics	---	---	---	---	---	43	4	556	8,689		183,032	166,091
Station Visits - Operations	11	1	0	0	1	0	0	40	0		40	36
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	12	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	32	10	235	1	119	172	44	95,282	9,995	1	305,445	277,174
Road Maintenance	1	0	0	0	0	0	0	31	0		31	28
Sub-total: Maintenance	1	0	0	0	0	0	0	31	0	0	31	28
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	17
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18
Total Emissions	60	15	256	1	126	173	44	98,200	9,995	1	308,372	279,829

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

Table U.17. Leasable Minerals – CBNG Development – Federal Wells (Alternative A – 2027)

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,718	0	0	2,726	2,474
Commuting Vehicles - Construction	10	1	1	0	1	0	0	149	0		149	135
Sub-total: Construction	26	4	21	1	8	2	0	2,866	0	0	2,875	2,609
Natural Gas Compression - Operations a	7	7	209	0	104	104	31	83,255	174	1	87,145	79,079
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	37	1,001		21,061	19,112
Pneumatics	---	---	---	---	---	39	4	500	7,820		164,729	149,482
Station Visits - Operations	11	1	0	0	0	0	0	18	0		18	16
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	19	0		19	18
Sub-total: Operations	29	9	212	0	107	154	39	85,817	8,996	1	274,963	249,513
Road Maintenance	1	0	0	0	0	0	0	28	0		28	26
Sub-total: Maintenance	1	0	0	0	0	0	0	28	0	0	28	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16
Total Emissions	57	14	233	1	114	156	40	88,729	8,996	1	277,884	252,164

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.18. Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	0	0	4	0	1	0	0	569	0	0	571	518
Commuting Vehicles - Construction	2	0	0	0	0	0	0	31	0		31	29
Sub-total: Construction	6	1	4	0	2	0	0	601	0	0	603	547
Natural Gas Compression - Operations	2	2	45	0	22	22	7	17,923	37	0	18,760	17,024
Dehydrators	0	0	0	0	0	2	1	264	0	0	265	240
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	1	0	8	216		4,534	4,114
Pneumatics	---	---	---	---	---	8	1	108	1,684		35,463	32,180
Station Visits - Operations	3	0	0	0	0	0	0	10	0		10	9
Well Workover - Operations	0	0	0	0	0	0	0	42	0	0	42	39
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	4
Sub-total: Operations	7	2	46	0	24	33	9	19,350	1,937	0	60,071	54,511
Road Maintenance	0	0	0	0	0	0	0	6	0		6	6
Sub-total: Maintenance	0	0	0	0	0	0	0	6	0	0	6	6
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	4	0		4	3
Sub-total: Reclamation	0	0	0	0	0	0	0	4	0	0	4	3
Total Emissions	13	3	51	0	25	34	9	19,960	1,937	0	60,683	55,066

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.19. Leasable Minerals – CBNG Development – Federal Wells (Alternative B – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	4	0	1	0	0	569	0	0	571	518
Commuting Vehicles - Construction	2	0	0	0	0	0	0	31	0		31	29
Sub-total: Construction	6	1	4	0	2	0	0	601	0	0	603	547
Natural Gas Compression - Operations a	1	1	41	0	20	20	6	16,189	34	0	16,945	15,376
Dehydrators	0	0	0	0	0	2	1	264	0	0	265	240
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	1	0	7	195		4,095	3,716
Pneumatics	---	---	---	---	---	8	1	97	1,521		32,031	29,066
Station Visits - Operations	3	0	0	0	0	0	0	5	0		5	4
Well Workover - Operations	0	0	0	0	0	0	0	42	0	0	42	39
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	4	0		4	3
Sub-total: Operations	7	2	42	0	21	30	8	17,599	1,749	0	54,379	49,346
Road Maintenance	0	0	0	0	0	0	0	5	0		5	5
Sub-total: Maintenance	0	0	0	0	0	0	0	5	0	0	5	5
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	3	0		3	3
Sub-total: Reclamation	0	0	0	0	0	0	0	3	0	0	3	3
Total Emissions	13	3	46	0	23	30	8	18,208	1,749	0	54,991	49,901

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.20. Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	20	1	7	2	0	2,724	0	0	2,732	2,479
Commuting Vehicles - Construction	10	1	1	0	1	0	0	150	0		150	136
Sub-total: Construction	27	4	21	1	8	2	0	2,874	0	0	2,882	2,615
Natural Gas Compression - Operations	8	8	234	0	117	117	35	93,277	195	1	97,635	88,598
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	42	1,122		23,596	21,412
Pneumatics	---	---	---	---	---	43	4	561	8,762		184,558	167,475
Station Visits - Operations	12	1	0	0	1	0	0	43	0		43	39
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	13	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	33	11	237	1	120	173	44	96,062	10,079	1	307,976	279,470
Road Maintenance	1	0	0	0	0	0	0	32	0		32	29
Sub-total: Maintenance	1	0	0	0	0	0	0	32	0	0	32	29
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	18
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18
Total Emissions	61	15	258	1	127	175	44	98,987	10,079	1	310,910	282,132

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression



**Table U.21. Leasable Minerals – CBNG Development – Federal Wells (Alternative C – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	5	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	20	1	7	2	0	2,724	0	0	2,732	2,479
Commuting Vehicles - Construction	10	1	1	0	1	0	0	150	0		150	136
Sub-total: Construction	27	4	21	1	8	2	0	2,874	0	0	2,882	2,615
Natural Gas Compression - Operations a	7	7	211	0	105	105	32	84,026	176	1	87,952	79,811
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	38	1,010		21,256	19,289
Pneumatics	---	---	---	---	---	39	4	505	7,893		166,254	150,866
Station Visits - Operations	11	1	0	0	0	0	0	18	0		18	16
Well Workover - Operations	0	0	1	0	0	0	0	203	0	0	204	185
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	20	0		20	18
Sub-total: Operations	29	9	214	0	107	156	40	86,593	9,079	1	277,491	251,806
Road Maintenance	1	0	0	0	0	0	0	29	0		29	26
Sub-total: Maintenance	1	0	0	0	0	0	0	29	0	0	29	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16
Total Emissions	57	14	235	1	115	158	40	89,513	9,079	1	280,419	254,464

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.22. Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	17	0	6	1	0	2,271	0	0	2,278	2,067
Commuting Vehicles - Construction	9	1	0	0	1	0	0	125	0		125	113
Sub-total: Construction	22	3	18	0	6	2	0	2,396	0	0	2,403	2,181
Natural Gas Compression - Operations	7	7	196	0	98	98	29	78,245	164	1	81,900	74,320
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	35	941		19,794	17,962
Pneumatics	---	---	---	---	---	36	4	470	7,350		154,815	140,485
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	0	0	1	0	0	0	0	169	0	0	170	154
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	18	0		18	17
Sub-total: Operations	28	9	199	0	100	145	37	80,756	8,454	1	258,520	234,591
Road Maintenance	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Maintenance	1	0	0	0	0	0	0	27	0	0	27	24
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	16	0		16	15
Sub-total: Reclamation	1	0	0	0	0	0	0	17	0	0	17	15
Total Emissions	52	12	217	1	107	147	37	83,196	8,454	1	260,966	236,811

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.23. Leasable Minerals – CBNG Development – Federal Wells (Alternative D – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	17	0	6	1	0	2,271	0	0	2,278	2,067
Commuting Vehicles - Construction	9	1	0	0	1	0	0	125	0		125	113
Sub-total: Construction	22	3	18	0	6	2	0	2,396	0	0	2,403	2,181
Natural Gas Compression - Operations a	6	6	176	0	88	88	26	70,343	147	1	73,629	66,814
Dehydrators	0	0	1	0	0	7	3	660	0	0	662	600
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	2	0	31	846		17,795	16,148
Pneumatics	---	---	---	---	---	33	3	423	6,608		139,181	126,298
Station Visits - Operations	10	1	0	0	0	0	0	17	0		17	15
Well Workover - Operations	0	0	1	0	0	0	0	169	0	0	170	154
Well & Pipeline Visits for Inspection & Repair - Operations	9	1	0	0	0	0	0	16	0		16	15
Sub-total: Operations	25	8	179	0	90	130	33	72,650	7,601	1	232,462	210,946
Road Maintenance	1	0	0	0	0	0	0	24	0		24	22
Sub-total: Maintenance	1	0	0	0	0	0	0	24	0	0	24	22
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	15	0		15	13
Sub-total: Reclamation	1	0	0	0	0	0	0	15	0	0	15	14
Total Emissions	49	12	196	1	96	132	33	75,085	7,601	1	234,904	213,162

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.24. Locatable Minerals – Bentonite Mining (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	0	0	---	---	---	---	---	---	---		---	---
Unpaved Roads	0	0	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	0	0	0	0	0	0	0		0	0
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	0	0	0	0	0	0	0		0	0
Total	101	11	0	0	0	0	0	61	0	0	61	56
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.25. Locatable Minerals – Bentonite Mining (Alternative A – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	8	0	3	1	0	2,391	0		2,392	2,170
Total	542	59	10	0	12	2	0	3,141	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.26. Locatable Minerals – Bentonite Mining (Alternative A – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	2	0	1	1	0	2,392	0		2,392	2,170
Total	542	59	5	0	10	1	0	3,142	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Lander Draft RMP and EIS

1591

**Table U.28. Locatable Minerals – Bentonite Mining (Alternative B – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	0	0	0	0	0	0	0	0	0	0	0	0
Product Handling, Transfer, and Storage	125	13	---	---	---	---	---	---	---		---	---
Unpaved Roads	22	2	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	3	0	0	230	0		230	209
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	0	0	0	797	0		797	723
Total	147	16	1	0	3	0	0	1,027	0	0	1,027	932
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												



**Table U.29. Locatable Minerals – Bentonite Mining (Alternative C – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	8	0	3	1	0	2,391	0		2,392	2,170
Total	542	59	10	0	12	2	0	3,141	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.30. Locatable Minerals – Bentonite Mining (Alternative C – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	374	40	---	---	---	---	---	---	---		---	---
Unpaved Roads	65	6	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	2	0	9	1	0	689	0		690	626
Heavy Equipment - Dust	1	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	1	1	2	0	1	1	0	2,392	0		2,392	2,170
Total	542	59	5	0	10	1	0	3,142	0	0	3,143	2,852
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Lander Draft RMP and EIS

1595

**Table U.32. Locatable Minerals – Bentonite Mining (Alternative D – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	101	11	0	0	0	0	0	61	0	0	61	56
Product Handling, Transfer, and Storage	249	27	---	---	---	---	---	---	---		---	---
Unpaved Roads	43	4	---	---	---	---	---	---	---		---	---
Commuting - Exhaust	0	0	1	0	6	0	0	459	0		460	417
Heavy Equipment - Dust	0	0	---	---	---	---	---	---	---		---	---
Heavy Equipment - Combustive	0	0	1	0	1	0	0	1,594	0		1,595	1,447
Total	395	43	3	0	7	1	0	2,115	0	0	2,116	1,920
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.33. Locatable Minerals – Gold Mining (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub> a	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	1	0	0	0	0	0	0	37	0	0	37	34
Mine Development	0	0	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	0	0	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	0	0	0	0	0	0	0		0	0
Heavy Equipment - Combustive	0	0	0	0	0	0	0	0	0		0	0
Total	1	0	0	0	0	0	0	37	0	0	37	34
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.34. Locatable Minerals – Gold Mining (All Alternatives – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub> a	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	5	1	1	0	1	0	0	149	0	0	150	137
Mine Development	220	67	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	88	9	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	2	1	0	396	0		396	359
Heavy Equipment - Combustive	1	1	6	0	2	1	0	1,865	0		1,865	1,693
Total	314	77	8	0	5	1	0	2,410	0	0	2,412	2,188
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

Table U.35. Locatable Minerals – Gold Mining (All Alternatives – 2027)

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub> a	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Exploratory Operations	5	1	1	0	1	0	0	149	0	0	150	136
Mine Development	216	66	---	---	---	---	---	---	---	---	---	---
Unpaved Roads	88	9	---	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	1	0	2	1	0	396	0		396	359
Heavy Equipment - Combustive	1	1	6	0	2	1	0	1,865	0		1,865	1,693
Total	310	76	8	0	5	1	0	2,410	0	0	2,411	2,188
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.36. Locatable Minerals – Uranium Mining (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	28	1	11	3	0	634	0	0	637	578
Wind Erosion	1	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	12	1	0	0	1	0	0	0	0	---	---	---
Sub-total: Construction	15	3	28	1	12	3	0	634	0	0	637	578
Transport of Ion Exchange Resin	7	1	0	0	0	0	0	0	0		0	0
Well Workover - Operations	2	0	1	0	0	0	0	114	0	0	114	103
Well & Pipeline Visits for Inspection & Repair - Operations	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Operations	10	1	1	0	0	0	0	114	0	0	114	104
Road Maintenance	0	0	0	0	0	0	0	0	0		0	0
Sub-total: Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	0	0	0	0	0	0	0	4	0		4	4
Sub-total: Reclamation	0	0	0	0	0	0	0	4	0	0	4	4
Total Emissions	25	4	30	1	13	3	0	752	0	0	755	685

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1



**Table U.37. Locatable Minerals – Uranium Mining (All Alternatives – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	9	9	117	3	45	10	1	2,620	0	0	2,626	2,383
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	50	5	1	0	6	0	0	0	0	---	---	---
Sub-total: Construction	64	14	118	3	51	11	1	2,620	0	0	2,626	2,383
Transport of Ion Exchange Resin	142	14	2	0	1	1	0	2,370	0		2,372	2,152
Well Workover - Operations	43	5	8	0	2	1	0	2,198	0	0	2,205	2,001
Well & Pipeline Visits for Inspection & Repair - Operations	2	0	0	0	0	0	0	5	0		5	4
Sub-total: Operations	187	19	10	0	4	1	0	4,573	0	0	4,582	4,158
Road Maintenance	0	0	0	0	0	0	0	5	0		5	5
Sub-total: Maintenance	0	0	0	0	0	0	0	5	0	0	5	5
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	3	0	0	0	0	0	0	80	0		80	72
Sub-total: Reclamation	3	0	0	0	0	0	0	80	0	0	80	72
Total Emissions	254	34	128	3	55	12	1	7,278	1	0	7,293	6,618

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1

**Table U.38. Locatable Minerals – Uranium Mining (All Alternatives – 2027)**

Activity	Annual Emissions (Tons)											CO <sub>2eq</sub> metric tonnes
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	
Well Pad & Station Construction - Fugitive Dust	2	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	9	9	117	3	45	10	1	2,620	0	0	2,626	2,383
Wind Erosion	2	0	---	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Construction	50	5	1	0	6	0	0	0	0	---	---	---
Sub-total: Construction	64	14	118	3	51	11	1	2,620	0	0	2,626	2,383
Transport of Ion Exchange Resin	85	9	1	0	1	1	0	2,371	0		2,373	2,153
Well Workover - Operations	25	3	1	0	0	0	0	1,310	0	0	1,315	1,193
Well & Pipeline Visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	3	0		3	3
Sub-total: Operations	112	11	2	0	1	1	0	3,685	0	0	3,691	3,349
Road Maintenance	0	0	0	0	0	0	0	3	0		3	3
Sub-total: Maintenance	0	0	0	0	0	0	0	3	0	0	3	3
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Pad Reclamation	2	0	0	0	0	0	0	47	0		47	43
Sub-total: Reclamation	2	0	0	0	0	0	0	47	0	0	47	43
Total Emissions	177	26	120	3	52	12	1	6,355	0	0	6,367	5,777

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1

September 2011

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**Table U.40. Salable Minerals – Sand & Gravel (Alternative A – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	74	4	33	7	1	21,151	0	21,153	19,195
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	330	41	79	4	39	9	1	22,361	0	22,364	20,294
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

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1605

**Table U.42. Salable Minerals – Sand & Gravel (Alternative B – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	265	26	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,162	0	1,163	1,055
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	72	4	32	7	1	20,304	0	20,307	18,427
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	319	40	76	4	38	9	1	21,466	0	21,469	19,482
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.43. Salable Minerals – Sand & Gravel (Alternative B – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	265	26	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,162	0	1,163	1,055
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	5	5	22	3	11	6	1	20,309	0	20,311	18,431
Wind Erosion	15	2	---	---	---	---	---	---	---	---	---
Total	301	36	26	3	16	8	1	21,471	0	21,473	19,486
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.44. Salable Minerals – Sand & Gravel (Alternative C – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> met- ric tonnes
Product Handling, Transfer, and Storage	4	1	---	---	---	---	---	---	---	---	---
Unpaved Roads	331	33	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	6	0	7	3	0	1,452	0	1,453	1,319
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	9	9	89	5	40	9	1	25,381	0	25,383	23,034
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	387	49	95	5	47	11	1	26,833	0	26,837	24,353
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											



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1609

**Table U.46. Salable Minerals – Sand & Gravel (Alternative D – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> met- ric tonnes
Product Handling, Transfer, and Storage	3	0	---	---	---	---	---	---	---	---	---
Unpaved Roads	276	28	---	---	---	---	---	---	---	---	---
Commuting - Exhaust	0	0	5	0	6	2	0	1,210	0	1,211	1,099
Heavy Equipment - Dust	13	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Combustive	7	7	74	4	33	7	1	21,151	0	21,153	19,195
Wind Erosion	31	5	---	---	---	---	---	---	---	---	---
Total	330	41	79	4	39	9	1	22,361	0	22,364	20,294
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

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1611

**Table U.48. Fire Management and Ecology (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust and Smoke	65	29	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	23	0		23	21
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0		20	18
Total	71	30	8	2	271	14	1	44	14	2	985	894
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

September 2011

	Annual Emissions (Tons)											
Activity	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	55	27	8	2	271	14	1	37	14	2	978	888

a HAPs = Hazardous Air Pollutants; assumed = VOCs \* 0.1

**Table U.50. Fire Management and Ecology (Alternative A – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	55	27	8	2	271	14	1	37	14	2	978	888
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

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1615

**Table U.52. Fire Management and Ecology (Alternative B – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust and Smoke	161	88	25	7	899	46	5	0	48	7	3,139	2,849
Heavy Equipment Exhaust	0	0	0	0	3	1	0	67	0		68	61
Commuting Vehicles - Fugitive Dust	17	2	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	61	0		62	56
Total	178	90	25	7	902	47	5	129	48	7	3,268	2,966
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												



**Table U.53. Fire Management and Ecology (Alternative C – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	32	0		32	29
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	25	0		25	22
Total	58	28	8	2	271	14	1	57	14	2	999	906
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.54. Fire Management and Ecology (Alternative C – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust and Smoke	50	27	8	2	270	14	1	0	14	2	942	855
Heavy Equipment Exhaust	0	0	0	0	1	0	0	32	0		32	29
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	25	0		25	22
Total	58	28	8	2	271	14	1	57	14	2	999	906
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

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1619

**Table U.56. Fire Management and Ecology (Alternative D – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust and Smoke	70	43	13	3	450	23	2	0	24	3	1,570	1,424
Heavy Equipment Exhaust	0	0	0	0	1	0	0	19	0		19	17
Commuting Vehicles - Fugitive Dust	5	0	---	---	---	---	---	---	---		---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	18	0		18	16
Total	75	43	13	3	450	23	2	37	24	3	1,606	1,458
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1												

**Table U.57. Vegetation – Forest and Woodlands (Base Year – 2008)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub> tons	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	32	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	32	3	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	38	4	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.58. Vegetation – Forest and Woodlands (Alternative A – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub> tons	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	131	13	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	131	13	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	138	14	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

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1623

**Table U.60. Vegetation – Forest and Woodlands (Alternative B – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub> tons	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	193	19	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	193	19	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	199	20	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											



Lander Draft RMP and EIS

1625

**Table U.62. Vegetation – Forest and Woodlands (Alternative C – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub> tons	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	263	26	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	263	26	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	269	27	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

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1627

**Table U.64. Vegetation – Forest and Woodlands (Alternative D – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub> tons	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	210	21	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	5	1	0	26	0	27	24
Sub-total: Heavy Equipment	210	21	0	0	5	1	0	26	0	27	24
Commuting Vehicles - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	20	0	20	18
Sub-total: Commuting Vehicles	6	1	0	0	0	0	0	20	0	20	18
Total	217	22	0	0	5	1	0	47	0	47	42
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Lander Draft RMP and EIS

1629

**Table U.66. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Base Year – 2008)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust	10	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	189	0	189	171
Sub-total: Heavy Equipment	10	1	2	0	1	0	0	189	0	189	171
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	13	1	2	0	1	0	0	202	0	202	183
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.67. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	37	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	504	0	504	457
Sub-total: Heavy Equipment	37	4	2	0	1	0	0	504	0	504	457
Commuting Vehicles - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	39	0	39	36
Sub-total: Commuting Vehicles	8	1	0	0	0	0	0	39	0	39	36
Total	45	5	2	0	1	0	0	543	0	543	493
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.68. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative A – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust	37	4	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	514	0	514	466
Sub-total: Heavy Equipment	37	4	1	0	0	0	0	514	0	514	466
Commuting Vehicles - Fugitive Dust	8	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	39	0	39	36
Sub-total: Commuting Vehicles	8	1	0	0	0	0	0	39	0	39	36
Total	45	5	1	0	1	0	0	553	0	553	502
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											



**Table U.69. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	218	0	218	198
Sub-total: Heavy Equipment	16	2	1	0	0	0	0	218	0	218	198
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	19	2	1	0	1	0	0	231	0	231	210
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.70. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative B – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust	16	2	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	220	0	220	200
Sub-total: Heavy Equipment	16	2	0	0	0	0	0	220	0	220	200
Commuting Vehicles - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	13	0	13	12
Sub-total: Commuting Vehicles	3	0	0	0	0	0	0	13	0	13	12
Total	19	2	0	0	0	0	0	233	0	233	212
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.71. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	408	41	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	2	2	25	1	11	2	0	6195	0	6196	5623
Sub-total: Heavy Equipment	411	43	25	1	11	2	0	6195	0	6196	5623
Commuting Vehicles - Fugitive Dust	129	13	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	1	0	3	1	0	779	0	779	707
Sub-total: Commuting Vehicles	129	13	1	0	3	1	0	779	0	779	707
Total	539	56	26	1	14	4	0	6974	0	6976	6330
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.72. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative C – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust	408	41	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	2	2	7	1	3	2	0	6203	0	6204	5629
Sub-total: Heavy Equipment	410	42	7	1	3	2	0	6203	0	6204	5629
Commuting Vehicles - Fugitive Dust	129	13	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	1	0	3	1	0	779	0	779	707
Sub-total: Commuting Vehicles	129	13	1	0	3	1	0	779	0	779	707
Total	539	55	9	1	6	3	0	6982	0	6983	6337
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.73. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	2	0	1	0	0	418	0	418	379
Sub-total: Heavy Equipment	31	3	2	0	1	0	0	418	0	418	379
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	34	0	34	31
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	34	0	34	31
Total	37	4	2	0	1	0	0	452	0	452	410
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.74. Land Resources – Renewable Energy, Rights-of-Way, Corridors (Alternative D – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Fugitive Dust	30	3	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	423	0	423	384
Sub-total: Heavy Equipment	30	3	0	0	0	0	0	423	0	423	384
Commuting Vehicles - Fugitive Dust	7	1	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	34	0	34	31
Sub-total: Commuting Vehicles	7	1	0	0	0	0	0	34	0	34	31
Total	37	4	1	0	0	0	0	456	0	456	414
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Lander Draft RMP and EIS

1639

**Table U.76. Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,661	2	3,710	3,367
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											



Table U.77. Land Resources – Comprehensive Trails and Travel Management (Alternative A – 2027)

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	3	3	8	1	522	88	9	3,796	4	3,876	3,517
Total	6	3	8	1	522	88	9	3,898	4	3,978	3,610
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.78. Land Resources – Comprehensive Trails and Travel Management (Alternative B – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Road Maintenance	2	0	0	0	0	0	0	90	0	90	82
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	6	4	7	1	526	119	12	3,649	2	3,698	3,356
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Lander Draft RMP and EIS

1643

**Table U.80. Land Resources – Comprehensive Trails and Travel Management (Alternative C – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Road Maintenance	3	0	0	0	0	0	0	127	0	127	115
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,685	2	3,735	3,389
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Lander Draft RMP and EIS

1645

**Table U.82. Land Resources – Comprehensive Trails and Travel Management Alternative D – 2018**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Road Maintenance	2	0	0	0	0	0	0	103	0	103	93
Motorized Recreation	4	4	7	1	526	119	12	3,558	2	3,608	3,274
Total	7	4	7	1	526	119	12	3,661	2	3,710	3,367
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

Lander Draft RMP and EIS

1647

**Table U.84. Land Resources – Livestock Grazing (Base Year – 2008)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	1	0	0	0	0	60	0	60	54
Sub-total: Construction	3	0	1	0	0	0	0	60	0	60	54
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	5	0	86	4	0	1,816	1,187	26,740	24,265
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											



**Table U.85. Land Resources – Livestock Grazing (Alternative A – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	62	0	62	56
Sub-total: Construction	3	0	0	0	0	0	0	62	0	62	56
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	4	0	86	4	0	1,818	1,187	26,742	24,267
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.86. Land Resources – Livestock Grazing (Alternative A – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	3	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	62	0	62	56
Sub-total: Construction	3	0	0	0	0	0	0	62	0	62	56
Commuting Vehicles - Fugitive Dust	77	7	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	86	4	0	1,756	0	1,761	1,598
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,187	24,919	22,613
Sub-total: Operations and Maintenance	77	8	4	0	86	4	0	1,756	1,187	26,680	24,211
Total	80	8	4	0	86	4	0	1,818	1,187	26,742	24,267
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.87. Land Resources – Livestock Grazing (Alternative B – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Sub-total: Construction	0	0	0	0	0	0	0	0	0	0	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Enteric Fermentation and Manure	---	---	---	---	---	---	---		0	0	0
Sub-total: Operations and Maintenance	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.88. Land Resources – Livestock Grazing (Alternative B – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Sub-total: Construction	0	0	0	0	0	0	0	0	0	0	0
Commuting Vehicles - Fugitive Dust	0	0	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	0	0	0	0	0	0	0	0	0
Enteric Fermentation and Manure	---	---	---	---	---	---	---		0	0	0
Sub-total: Operations and Maintenance	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.89. Land Resources – Livestock Grazing (Alternative C – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.90. Land Resources – Livestock Grazing (Alternative C – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.91. Land Resources – Livestock Grazing (Alternative D – 2018)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											

**Table U.92. Land Resources – Livestock Grazing (Alternative D – 2027)**

Activity	Annual Emissions (Tons)										
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Heavy Equipment - Fugitive Dust	6	1	---	---	---	---	---	---	---	---	---
Heavy Equipment - Vehicle Exhaust	0	0	0	0	0	0	0	144	0	144	131
Sub-total: Construction	6	1	0	0	0	0	0	144	0	144	131
Commuting Vehicles - Fugitive Dust	78	8	---	---	---	---	---	---	---	---	---
Commuting Vehicles - Vehicle Exhaust	0	0	4	0	87	4	0	1,808	0	1,813	1,645
Enteric Fermentation and Manure	---	---	---	---	---	---	---		1,614	33,894	30,757
Sub-total: Operations and Maintenance	78	8	4	0	87	4	0	1,808	1,614	35,707	32,402
Total	84	8	5	0	87	4	0	1,952	1,614	35,852	32,533
a HAPs = Hazardous Air Pollutants; assumed = VOCs * 0.1											



**Table U.93. Leasable Minerals – Conventional Oil and Gas Development – Total (BLM + non-BLM) Wells (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	32	3	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	8	7	136	3	37	10	1	15,705	0	0	15,757	14,254
Well Completion Flaring	0	0	2	0	11	63	6	2	0	0	2	2
Commuting Vehicles - Construction	30	3	1	0	1	0	0	315	0		315	286
Wind Erosion	6	1	---	---	---	---	---	---	---		---	---
Sub-total: Construction	77	15	139	3	50	73	7	16,022	0	0	16,074	14,542
Natural Gas Compression - Operations a	26	26	766	2	383	383	115	305,692	639	3	319,968	290,821
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	0	0	0	0	0	428	0	0	428	388
Dehy Venting and Flashing	---	---	---	---	---	600	225	6,516	397		14,860	14,257
Station Visits - Operations	58	6	1	0	3	1	0	201	0		201	182
Well Workover - Operations	0	0	2	0	1	0	0	317	0	0	318	287
Well & Pipeline visits for Inspection & Repair - Operations	71	7	1	0	2	1	0	123	0		123	111
Tanks Condensate and Loadout	---	---	---	---	---	700	70	49	117		2,498	2,493
Wellhead Fugitives	---	---	---	---	---	1,070	107	630	9,808		206,595	206,537
Pneumatic Devices	---	---	---	---	---	785	79	463	7,203		151,728	151,686
Sub-total: Operations	156	40	770	2	389	3,540	596	314,418	18,164	3	696,719	666,762
Road Maintenance	4	0	1	0	0	0	0	149	0		149	135
Sub-total: Maintenance	4	0	1	0	0	0	0	149	0	0	149	135
Road Reclamation	0	0	0	0	0	0	0	3	0		3	3
Well Reclamation	3	0	0	0	0	0	0	93	0		93	85
Sub-total: Reclamation	3	0	0	0	0	0	0	96	0	0	96	87

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Total Emissions	240	55	910	5	439	3,614	603	330,685	18,164	3	713,038	681,527
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.94. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2018)

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	55	55	1,604	3	802	802	241	640,389	1,339	6	670,295	609,234
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	896	0	0	898	813
Dehy Venting and Flashing	---	---	---	---	---	1,257	471	13,651	832		31,130	29,866
Station Visits - Operations	122	12	2	0	6	3	0	421	0		421	382
Well Workover - Operations	2	1	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	149	15	1	0	4	2	0	257	0		257	233
Tanks Condensate and Loadout	---	---	---	---	---	1,466	147	102	244		5,233	5,223
Wellhead Fugitives	---	---	---	---	---	2,241	224	1,320	20,546		432,792	432,670
Pneumatic Devices	---	---	---	---	---	1,646	165	969	15,090		317,853	317,763
Sub-total: Operations	328	83	1,618	4	816	7,416	1,248	659,335	38,052	6	1,460,212	1,397,393
Road Maintenance	9	1	1	0	1	0	0	312	0		312	283
Sub-total: Maintenance	9	1	1	0	1	0	0	312	0	0	312	283
Road Reclamation	0	0	0	0	0	0	0	7	0		7	6
Well Reclamation	7	1	1	0	1	0	0	195	0		195	177

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	202	0	0	202	183
Total Emissions	604	141	2,196	17	1,022	7,725	1,279	726,368	38,052	6	1,527,466	1,458,236
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.95. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative A – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	43	43	1,251	3	626	626	188	499,550	1,045	4	522,878	475,246
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	699	0	0	700	634
Dehy Venting and Flashing	---	---	---	---	---	980	368	10,649	649		24,284	23,298
Station Visits - Operations	95	10	2	0	5	2	0	329	0		329	298
Well Workover - Operations	2	0	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	116	12	1	0	3	1	0	201	0		201	182
Tanks Condensate and Loadout	---	---	---	---	---	1,144	114	79	191		4,082	4,074
Wellhead Fugitives	---	---	---	---	---	1,748	175	1,029	16,028		337,609	337,513
Pneumatic Devices	---	---	---	---	---	1,284	128	756	11,771		247,948	247,878
Sub-total: Operations	257	65	1,264	3	637	5,785	973	514,621	29,683	5	1,139,364	1,090,332
Road Maintenance	7	1	0	0	0	0	0	243	0		243	221
Sub-total: Maintenance	7	1	0	0	0	0	0	243	0	0	243	221
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	151	0		151	137

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	156	0	0	156	142
Total Emissions	528	122	1,841	16	843	6,094	1,004	581,540	29,684	5	1,206,503	1,151,072
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.96. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	73	7	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	27	26	483	11	132	36	4	56,027	1	1	56,215	50,853
Well Completion Flaring	1	1	7	0	40	227	23	8	0	0	8	7
Commuting Vehicles - Construction	103	11	4	0	4	1	0	1,036	0		1,037	941
Wind erosion	23	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	227	48	495	11	176	264	26	57,072	1	1	57,260	51,802
Natural Gas Compression - Operations a	51	51	1,483	3	741	741	222	591,959	1,238	5	619,603	563,160
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	828	0	0	830	752
Dehy Venting and Flashing	---	---	---	---	---	1,162	436	12,619	769		28,776	27,608
Station Visits - Operations	113	11	2	0	6	3	0	389	0		389	353
Well Workover - Operations	2	1	8	0	2	1	0	1,140	0	0	1,144	1,034
Well & Pipeline Visits for Inspection & Repair - Operations	138	14	1	0	4	2	0	238	0		238	216
Tanks Condensate and Loadout	---	---	---	---	---	1,355	136	94	226		4,837	4,828
Wellhead Fugitives	---	---	---	---	---	2,071	207	1,220	18,992		400,061	399,948
Pneumatic Devices	---	---	---	---	---	1,521	152	896	13,949		293,815	293,732
Sub-total: Operations	303	77	1,495	3	754	6,855	1,153	609,382	35,174	5	1,349,692	1,291,631
Road Maintenance	8	1	1	0	0	0	0	288	0		288	261
Sub-total: Maintenance	8	1	1	0	0	0	0	288	0	0	288	261
Road Reclamation	0	0	0	0	0	0	0	6	0		6	5
Well Reclamation	6	1	1	0	1	0	0	180	0		181	164

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	186	0	0	187	169
Total Emissions	545	127	1,991	14	931	7,120	1,180	666,928	35,175	6	1,407,426	1,343,864
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												



**Table U.97. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative B – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	73	7	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	27	26	483	11	132	36	4	56,027	1	1	56,215	50,853
Well Completion Flaring	1	1	7	0	40	227	23	8	0	0	8	7
Commuting Vehicles - Construction	103	11	4	0	4	1	0	1,036	0		1,037	941
Wind Erosion	23	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	227	48	495	11	176	264	26	57,072	1	1	57,260	51,802
Natural Gas Compression - Operations a	40	40	1,158	2	579	579	174	462,181	966	4	483,765	439,696
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	646	0	0	648	587
Dehy Venting and Flashing	---	---	---	---	---	907	340	9,852	601		22,467	21,555
Station Visits - Operations	88	9	2	0	5	2	0	304	0		304	276
Well Workover - Operations	2	0	8	0	2	1	0	1,140	0	0	1,144	1,034
Well & Pipeline Visits for Inspection & Repair - Operations	107	11	1	0	3	1	0	186	0		186	168
Tanks Condensate and Loadout	---	---	---	---	---	1,058	106	73	176		3,776	3,770
Wellhead Fugitives	---	---	---	---	---	1,617	162	952	14,829		312,354	312,266
Pneumatic Devices	---	---	---	---	---	1,188	119	699	10,891		229,401	229,336
Sub-total: Operations	237	60	1,169	3	589	5,353	900	476,034	27,463	4	1,054,044	1,008,688
Road Maintenance	6	1	0	0	0	0	0	225	0		225	204
Sub-total: Maintenance	6	1	0	0	0	0	0	225	0	0	225	204
Road Reclamation	0	0	0	0	0	0	0	5	0		5	4
Well Reclamation	5	0	0	0	0	0	0	140	0		140	127

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	144	0	0	144	131
Total Emissions	475	109	1,664	14	766	5,617	927	533,475	27,463	5	1,111,673	1,060,825
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.98. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	55	55	1,606	3	803	803	241	641,199	1,341	6	671,142	610,004
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	897	0	0	899	814
Dehy Venting and Flashing	---	---	---	---	---	1,258	472	13,669	833		31,169	29,904
Station Visits - Operations	122	12	2	0	6	3	0	422	0		422	383
Well Workover - Operations	2	1	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	149	15	1	0	4	2	0	257	0		257	234
Tanks Condensate and Loadout	---	---	---	---	---	1,468	147	102	245		5,239	5,230
Wellhead Fugitives	---	---	---	---	---	2,243	224	1,321	20,572		433,339	433,217
Pneumatic Devices	---	---	---	---	---	1,648	165	970	15,109		318,255	318,165
Sub-total: Operations	329	83	1,620	4	817	7,426	1,249	660,166	38,100	6	1,462,056	1,399,157
Road Maintenance	9	1	1	0	1	0	0	312	0		312	283
Sub-total: Maintenance	9	1	1	0	1	0	0	312	0	0	312	283
Road Reclamation	0	0	0	0	0	0	0	7	0		7	6
Well Reclamation	7	1	1	0	1	0	0	195	0		196	177

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	202	0	0	202	183
Total Emissions	604	141	2,199	17	1,023	7,734	1,280	727,201	38,100	6	1,529,311	1,460,002
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

Table U.99. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative C – 2027)

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	80	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	32	31	564	13	153	42	4	65,312	1	1	65,531	59,281
Well Completion Flaring	1	1	9	0	47	264	26	9	0	0	9	8
Commuting Vehicles - Construction	119	12	4	0	5	2	0	1,199	0		1,200	1,089
Wind Erosion	27	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	259	56	577	13	205	308	31	66,521	1	1	66,740	60,378
Natural Gas Compression - Operations a	43	43	1,254	3	627	627	188	500,359	1,046	5	523,725	476,017
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	700	0	0	701	635
Dehy Venting and Flashing	---	---	---	---	---	982	368	10,666	650		24,323	23,336
Station Visits - Operations	95	10	2	0	5	2	0	329	0		329	299
Well Workover - Operations	2	0	9	0	3	1	0	1,330	0	0	1,334	1,207
Well & Pipeline Visits for Inspection & Repair - Operations	116	12	1	0	3	1	0	201	0		201	182
Tanks Condensate and Loadout	---	---	---	---	---	1,145	115	80	191		4,088	4,081
Wellhead Fugitives	---	---	---	---	---	1,751	175	1,031	16,054		338,156	338,060
Pneumatic Devices	---	---	---	---	---	1,286	129	757	11,790		248,350	248,280
Sub-total: Operations	257	65	1,266	3	638	5,795	975	515,452	29,731	5	1,141,208	1,092,096
Road Maintenance	7	1	0	0	0	0	0	243	0		243	221
Sub-total: Maintenance	7	1	0	0	0	0	0	243	0	0	243	221
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	151	0		151	137

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	156	0	0	156	142
Total Emissions	529	122	1,843	16	844	6,103	1,006	582,373	29,732	5	1,208,348	1,152,837
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.100. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	79	8	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	31	30	546	12	148	41	4	63,249	1	1	63,461	57,408
Well Completion Flaring	1	1	8	0	46	256	26	9	0	0	9	8
Commuting Vehicles - Construction	115	12	4	0	5	2	0	1,163	0		1,164	1,056
Wind Erosion	26	4	---	---	---	---	---	---	---	---	---	---
Sub-total: Construction	252	54	559	12	199	298	30	64,421	1	1	64,634	58,472
Natural Gas Compression - Operations a	54	54	1,579	3	789	789	237	630,271	1,318	6	659,705	599,609
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	1	0	0	882	0	0	883	800
Dehy Venting and Flashing	---	---	---	---	---	1,237	464	13,436	819		30,638	29,394
Station Visits - Operations	120	12	2	0	6	3	0	414	0		415	376
Well Workover - Operations	2	1	9	0	3	1	0	1,287	0	0	1,292	1,168
Well & Pipeline Visits for Inspection & Repair - Operations	146	15	1	0	4	2	0	253	0		253	230
Tanks Condensate and Loadout	---	---	---	---	---	1,443	144	100	240		5,150	5,141
Wellhead Fugitives	---	---	---	---	---	2,205	221	1,299	20,222		425,954	425,834
Pneumatic Devices	---	---	---	---	---	1,620	162	954	14,851		312,831	312,743
Sub-total: Operations	323	82	1,592	4	803	7,299	1,228	648,896	37,450	6	1,437,121	1,375,295
Road Maintenance	9	1	1	0	0	0	0	307	0		307	278
Sub-total: Maintenance	9	1	1	0	0	0	0	307	0	0	307	278
Road Reclamation	0	0	0	0	0	0	0	6	0		6	6
Well Reclamation	7	1	1	0	1	0	0	192	0		192	174

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	7	1	1	0	1	0	0	199	0	0	199	180
Total Emissions	591	138	2,153	16	1,003	7,598	1,258	713,822	37,451	6	1,502,260	1,434,226
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												



**Table U.101. Leasable Minerals – Conventional Oil and Gas Development – Total Wells (Alternative D – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	79	8	---	---	---	---	---	---	---		---	---
Heavy Equipment Combustive Emissions a	31	30	546	12	148	41	4	63,249	1	1	63,461	57,408
Well Completion Flaring	1	1	8	0	46	256	26	9	0	0	9	8
Commuting Vehicles - Construction	115	12	4	0	5	2	0	1,163	0		1,164	1,056
Wind Erosion	26	4	---	---	---	---	---	---	---		---	---
Sub-total: Construction	252	54	559	12	199	298	30	64,421	1	1	64,634	58,472
Natural Gas Compression - Operations a	42	42	1,232	3	616	616	185	491,860	1,028	4	514,829	467,931
Separator, Dehydrator & Water Tank Heaters - Operations a	0	0	1	0	0	0	0	688	0	0	689	625
Dehy Venting and Flashing	---	---	---	---	---	965	362	10,485	639		23,910	22,939
Station Visits - Operations	94	9	2	0	5	2	0	323	0		323	294
Well Workover - Operations	2	0	9	0	3	1	0	1,287	0	0	1,292	1,168
Well & Pipeline Visits for Inspection & Repair - Operations	114	11	1	0	3	1	0	197	0		198	179
Tanks Condensate and Loadout	---	---	---	---	---	1,126	113	78	188		4,019	4,012
Wellhead Fugitives	---	---	---	---	---	1,721	172	1,014	15,781		332,412	332,318
Pneumatic Devices	---	---	---	---	---	1,264	126	744	11,590		244,131	244,063
Sub-total: Operations	253	64	1,244	3	627	5,696	958	506,677	29,226	4	1,121,804	1,073,529
Road Maintenance	7	1	0	0	0	0	0	239	0		239	217
Sub-total: Maintenance	7	1	0	0	0	0	0	239	0	0	239	217
Road Reclamation	0	0	0	0	0	0	0	5	0		5	5
Well Reclamation	5	1	0	0	0	0	0	149	0		149	135

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Sub-total: Reclamation	5	1	0	0	0	0	0	154	0	0	154	139
Total Emissions	517	119	1,803	15	826	5,995	988	571,491	29,227	5	1,186,830	1,132,357
a HAPs = Hazardous Air Pollutants, assumed = VOCs*0.1; dehydrator unit HAP and formaldehyde HAP (gas compression) added separately												

**Table U.102. Leasable Minerals – CBNG Development – Total (BLM + non-BLM) Wells (Base Year – 2008)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	1	0	---	---	---	---	---	---	---	---	---	---
Wind Erosion	0	0	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	0	0	1	0	0	0	0	129	0	0	129	117
Commuting Vehicles - Construction	1	0	0	0	0	0	0	9	0		9	8
Sub-total: Construction	2	0	1	0	0	0	0	137	0	0		125
Natural Gas Compression - Operations a	0	0	14	0	7	7	2	5,396	11	0	5,648	5,125
Dehydrators	0	0	0	0	0	1	0	132	0	0	132	120
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	0	0	2	65		1,365	1,239
Pneumatics	---	---	---	---	---	3	0	32	507		10,677	9,689
Station Visits - Operations	6	1	0	0	0	0	0	10	0		10	9
Well Workover - Operations	0	0	0	0	0	0	0	8	0	0	8	8
Well & Pipeline Visits for Inspection & Repair - Operations	1	0	0	0	0	0	0	1	0		1	1
Sub-total: Operations	7	1	15	0	8	10	3	6,573	583	0	18,835	17,091
Road Maintenance	0	0	0	0	0	0	0	2	0		2	2
Sub-total: Maintenance	0	0	0	0	0	0	0	2	0	0	2	2
Road Reclamation	0	0	0	0	0	0	0	0	0		0	0
Well Reclamation	0	0	0	0	0	0	0	1	0		1	1
Sub-total: Reclamation	0	0	0	0	0	0	0	1	0	0	1	1
Total Emissions	9	1	16	0	8	10	3	6,713	583	0	18,838	17,219

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.103. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	35	1	12	3	0	4,646	0	0	4,660	4,229
Commuting Vehicles - Construction	18	2	1	0	1	0	0	255	0		255	231
Sub-total: Construction	45	7	36	1	13	3	0	4,900	0	0	4,915	4,460
Natural Gas Compression - Operations	14	14	397	1	199	199	60	158,609	332	1	166,019	150,653
Dehydrators	0	0	1	0	1	15	8	1,453	0	0	1,456	1,321
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	1	71	1,907		40,124	36,410
Pneumatics	---	---	---	---	---	74	7	953	14,899		313,824	284,777
Station Visits - Operations	20	2	0	0	1	0	0	69	0		69	63
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	21	2	0	0	1	0	0	37	0		37	34
Sub-total: Operations	56	18	402	1	203	294	75	162,530	17,138	1	522,870	474,473
Road Maintenance	1	0	0	0	0	0	0	54	0		54	49
Sub-total: Maintenance	1	0	0	0	0	0	0	54	0	0	54	49
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	33	0		33	30
Sub-total: Reclamation	1	0	0	0	0	0	0	34	0	0	34	31
Total Emissions	103	25	438	2	216	297	75	167,518	17,138	1	527,873	479,013

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.104. Leasable Minerals – CBNG Development – Total Wells (Alternative A – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	17	2	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	35	1	12	3	0	4,646	0	0	4,660	4,229
Commuting Vehicles - Construction	18	2	1	0	1	0	0	255	0		255	231
Sub-total: Construction	45	7	36	1	13	3	0	4,900	0	0	4,915	4,460
Natural Gas Compression - Operations a	12	12	358	1	179	179	54	142,806	299	1	149,478	135,642
Dehydrators	0	0	1	0	1	14	7	1,321	0	0	1,323	1,201
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	64	1,717		36,126	32,782
Pneumatics	---	---	---	---	---	67	7	858	13,414		282,556	256,403
Station Visits - Operations	18	2	0	0	0	0	0	31	0		31	28
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	19	2	0	0	1	0	0	33	0		33	30
Sub-total: Operations	50	16	362	1	182	265	68	146,451	15,430	1	470,889	427,304
Road Maintenance	1	0	0	0	0	0	0	48	0		48	44
Sub-total: Maintenance	1	0	0	0	0	0	0	48	0	0	48	44
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Reclamation	1	0	0	0	0	0	0	31	0	0	31	28
Total Emissions	97	23	398	2	195	268	68	151,431	15,430	1	475,883	431,836

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.105. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	9	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	1	1	19	0	6	1	0	2,491	0	0	2,499	2,268
Commuting Vehicles - Construction	10	1	1	0	1	0	0	136	0		137	124
Sub-total: Construction	24	4	19	0	7	2	0	2,628	0	0	2,635	2,392
Natural Gas Compression - Operations	7	7	211	0	105	105	32	84,026	176	1	87,952	79,811
Dehydrators	0	0	1	0	1	8	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	38	1,010		21,256	19,289
Pneumatics	---	---	---	---	---	39	4	505	7,893		166,254	150,866
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	0	0	1	0	0	0	0	186	0	0	187	169
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	20	0		20	18
Sub-total: Operations	29	9	214	0	108	156	40	86,594	9,079	1	277,492	251,807
Road Maintenance	1	0	0	0	0	0	0	29	0		29	26
Sub-total: Maintenance	1	0	0	0	0	0	0	29	0	0	29	26
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	17	0		17	16
Sub-total: Reclamation	1	0	0	0	0	0	0	18	0	0	18	16
Total Emissions	55	13	233	1	115	158	40	89,268	9,079	1	280,174	254,241

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.106. Leasable Minerals – CBNG Development – Total Wells (Alternative B – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	9	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	4	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	1	1	19	0	6	1	0	2,491	0	0	2,499	2,268
Commuting Vehicles - Construction	10	1	1	0	1	0	0	136	0		137	124
Sub-total: Construction	24	4	19	0	7	2	0	2,628	0	0	2,635	2,392
Natural Gas Compression - Operations a	6	6	189	0	95	95	28	75,547	158	1	79,076	71,757
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	34	908		19,111	17,342
Pneumatics	---	---	---	---	---	35	4	454	7,096		149,477	135,641
Station Visits - Operations	10	1	0	0	0	0	0	17	0		17	15
Well Workover - Operations	0	0	1	0	0	0	0	186	0	0	187	169
Well & Pipeline Visits for Inspection & Repair - Operations	10	1	0	0	0	0	0	18	0		18	16
Sub-total: Operations	27	9	192	0	97	140	36	78,038	8,163	1	249,671	226,562
Road Maintenance	1	0	0	0	0	0	0	26	0		26	23
Sub-total: Maintenance	1	0	0	0	0	0	0	26	0	0	26	23
Road Reclamation	0	0	0	0	0	0	0	1	0		1	0
Well Reclamation	1	0	0	0	0	0	0	16	0		16	14
Sub-total: Reclamation	1	0	0	0	0	0	0	16	0	0	16	15
Total Emissions	52	12	211	1	104	142	36	80,707	8,163	1	252,348	228,991

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.107. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	13	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	34	1	12	3	0	4,596	0	0	4,610	4,183
Commuting Vehicles - Construction	17	2	1	0	1	0	0	247	0		247	225
Sub-total: Construction	41	7	35	1	13	3	0	4,843	0	0	4,858	4,408
Natural Gas Compression - Operations	8	8	234	0	117	117	35	93,277	195	1	97,635	88,598
Dehydrators	0	0	1	0	1	9	4	924	0	0	926	841
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	42	1,122		23,596	21,412
Pneumatics	---	---	---	---	---	43	4	561	8,762		184,558	167,475
Station Visits - Operations	12	1	0	0	1	0	0	43	0		43	39
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	13	1	0	0	0	0	0	22	0		22	20
Sub-total: Operations	34	11	238	1	120	173	44	96,206	10,079	1	308,120	279,601
Road Maintenance	1	0	0	0	0	0	0	32	0		32	29
Sub-total: Maintenance	1	0	0	0	0	0	0	32	0	0	32	29
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	19	0		19	18
Sub-total: Reclamation	1	0	0	0	0	0	0	20	0	0	20	18
Total Emissions	76	17	274	1	133	176	45	101,100	10,079	1	313,030	284,056

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression



**Table U.108. Leasable Minerals – CBNG Development – Total Wells (Alternative C – 2027)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	13	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	8	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	34	1	12	3	0	4,596	0	0	4,610	4,183
Commuting Vehicles - Construction	17	2	1	0	1	0	0	247	0		247	225
Sub-total: Construction	41	7	35	1	13	3	0	4,843	0	0	4,858	4,408
Natural Gas Compression - Operations a	12	12	359	1	180	180	54	143,384	300	1	150,083	136,192
Dehydrators	0	0	1	0	1	14	7	1,321	0	0	1,323	1,201
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	64	1,724		36,272	32,915
Pneumatics	---	---	---	---	---	67	7	862	13,469		283,700	257,441
Station Visits - Operations	18	2	0	0	0	0	0	31	0		31	28
Well Workover - Operations	1	0	2	0	1	0	0	347	0	0	348	316
Well & Pipeline Visits for Inspection & Repair - Operations	19	2	0	0	1	0	0	33	0		33	30
Sub-total: Operations	50	16	364	1	183	266	68	147,033	15,493	1	472,784	429,024
Road Maintenance	1	0	0	0	0	0	0	49	0		49	44
Sub-total: Maintenance	1	0	0	0	0	0	0	49	0	0	49	44
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	30	0		30	27
Sub-total: Reclamation	1	0	0	0	0	0	0	31	0	0	31	28
Total Emissions	94	23	399	2	196	269	68	151,955	15,493	1	477,721	433,504

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

**Table U.109. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2018)**

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	12	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	7	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions	2	2	32	1	11	2	0	4,253	0	0	4,266	3,871
Commuting Vehicles - Construction	16	2	1	0	1	0	0	228	0		228	207
Sub-total: Construction	37	6	33	1	12	3	0	4,481	0	0	4,495	4,079
Natural Gas Compression - Operations	7	7	196	0	98	98	29	78,245	164	1	81,900	74,320
Dehydrators	0	0	1	0	1	7	4	792	0	0	794	720
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	3	0	35	941		19,794	17,962
Pneumatics	---	---	---	---	---	36	4	470	7,350		154,815	140,485
Station Visits - Operations	11	1	0	0	1	0	0	36	0		36	33
Well Workover - Operations	1	0	2	0	1	0	0	321	0	0	323	293
Well & Pipeline Visits for Inspection & Repair - Operations	11	1	0	0	0	0	0	18	0		18	17
Sub-total: Operations	28	9	200	0	101	145	37	80,909	8,454	1	258,672	234,730
Road Maintenance	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Maintenance	1	0	0	0	0	0	0	27	0	0	27	24
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	16	0		16	15
Sub-total: Reclamation	1	0	0	0	0	0	0	17	0	0	17	15
Total Emissions	67	15	233	1	113	148	37	85,433	8,454	1	263,210	238,848

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression

Table U.110. Leasable Minerals – CBNG Development – Total Wells (Alternative D – 2027)

Activity	Annual Emissions (Tons)											
	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	VOC	HAPs a	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2eq</sub>	CO <sub>2eq</sub> metric tonnes
Well Pad & Station Construction - Fugitive Dust	12	1	---	---	---	---	---	---	---	---	---	---
Wind Erosion	7	1	---	---	---	---	---	---	---	---	---	---
Heavy Equipment Combustive Emissions a	2	2	32	1	11	2	0	4,253	0	0	4,266	3,871
Commuting Vehicles - Construction	16	2	1	0	1	0	0	228	0		228	207
Sub-total: Construction	37	6	33	1	12	3	0	4,481	0	0	4,495	4,079
Natural Gas Compression - Operations a	11	11	325	1	163	163	49	129,894	272	1	135,962	123,378
Dehydrators	0	0	1	0	1	12	6	1,189	0	0	1,191	1,081
Central Processing Heaters	0	0	1	0	1	0	0	990	0	0	992	901
Wellhead Fugitives	---	---	---	---	---	5	0	58	1,562		32,859	29,818
Pneumatics	---	---	---	---	---	61	6	781	12,201		257,008	233,220
Station Visits - Operations	16	2	0	0	0	0	0	28	0		28	25
Well Workover - Operations	1	0	2	0	1	0	0	321	0	0	323	293
Well & Pipeline Visits for Inspection & Repair - Operations	18	2	0	0	0	0	0	30	0		30	28
Sub-total: Operations	46	15	330	1	166	241	62	133,292	14,035	1	428,394	388,743
Road Maintenance	1	0	0	0	0	0	0	44	0		44	40
Sub-total: Maintenance	1	0	0	0	0	0	0	44	0	0	44	40
Road Reclamation	0	0	0	0	0	0	0	1	0		1	1
Well Reclamation	1	0	0	0	0	0	0	27	0		27	24
Sub-total: Reclamation	1	0	0	0	0	0	0	28	0	0	28	25
Total Emissions	85	21	363	2	178	244	62	137,845	14,035	1	432,961	392,887

a HAPs = Hazardous Air Pollutants, assumed = VOCs\*0.1, and formaldehyde HAP added for gas compression